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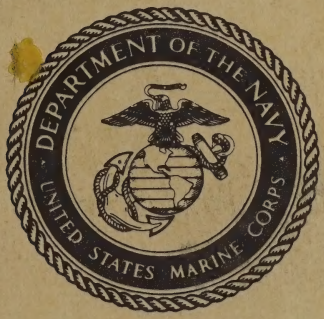
U. S. MARINE CORPS TECHNICAL MANUAL

RADIO RECEIVER
AN/PRR-15

FSN 5820-082-5186

OPERATION AND MAINTENANCE



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DEPARTMENT OF THE NAVY
Headquarters, U.S. Marine Corps
Washington, D. C. 20380

29 May 1969

1. This Manual is effective upon receipt and provides installation, operation, troubleshooting, maintenance, and repair instructions for the first through fifth echelons of operation and/or maintenance on the Radio Receiver, AN/PRR-15.

2. Notice of discrepancies and suggested changes to this Manual should be directed to the Commandant of the Marine Corps (Code CSY).

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

OFFICIAL

Wallace H. Robinson Jr.

WALLACE H. ROBINSON, Jr.
Major General, U.S. Marine Corps
Quartermaster General of the Marine Corps

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2-0 thru 2-6	ORIGINAL		

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RECORD OF CHANGES

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SAFETY SUMMARY

LISTED BELOW IS EVERY "WARNING" CONTAINED IN THIS MANUAL AND THE PAGE ON WHICH THE "WARNING" IS LOCATED. ALL PERSONNEL INVOLVED IN THE OPERATION AND MAINTENANCE OF THIS EQUIPMENT MUST FULLY UNDERSTAND THE "WARNING" AND THE PROCEDURE BY WHICH THE HAZARD IS TO BE REDUCED OR ELIMINATED. PERSONNEL SHALL BECOME THOROUGHLY FAMILIAR WITH ALL ASPECTS OF SAFETY OF PERSONNEL AND EQUIPMENT PRIOR TO THE OPERATION AND MAINTENANCE OF THE EQUIPMENT.

1. Spare fuses will normally be stored in the pocket in the cover of either the receiver housing or the accessory case. (Page 3-15)

2. Be sure to use only the correct fuse. Fuse F1 is a 0.2 ampere fuse and Fuse F2 is a 0.5 ampere fuse. (Page 3-15)

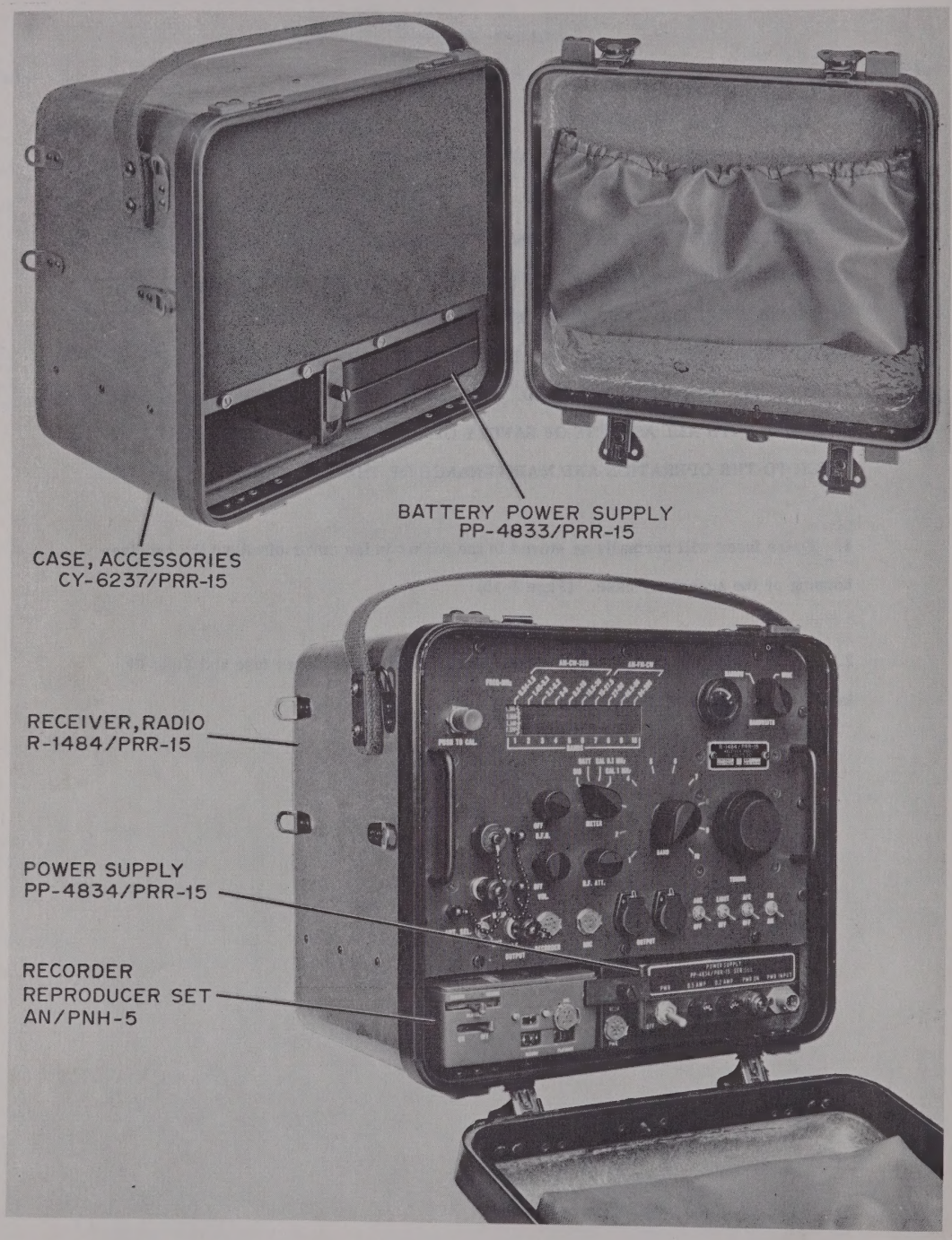


Figure 1-1. Receiving Set, Radio AN/PRR-15

SECTION 1

GENERAL INFORMATION

1-1. SCOPE.

This publication contains installation, operation, troubleshooting, maintenance and repair instructions for Receiving Set, Radio AN/PRR-15 (Figure 1-1). This equipment is manufactured by Zenith Radio Corporation, Chicago, Illinois. In addition to these instructions, this publication provides the operator with a brief description of the equipment, its intended use, capabilities, limitations, condensed factual data for rapid reference purposes, and a brief functional description. This manual is effective upon receipt; extracts may be used in preparing other Department of Defense publications.

1-2. GENERAL DESCRIPTION.

a. Receiving Set, Radio, AN/PRR-15 (Figure 1-1) consisting of Receiver, Radio R-1484/PRR-15 and Case, Accessories CY-6237/PRR-15 with accessories, is a portable receiver covering all frequencies from 0.54 Megahertz (MHz) to 205 Megahertz (MHz), and incorporates capabilities for the detection of Amplitude-Modulated (AM), Frequency-Modulated (FM), Continuous-Wave (CW), or Single-Sideband (SSB) signals.

b. Receiver, Radio, R-1484/PRR-15, hereafter known as the "receiver," is a lightweight, man-portable receiver that is transistorized to provide low current drain. The receiver is capable of receiving horizontally and vertically polarized radio signals that are either modulated or unmodulated receiver output can be monitored and/or recorded on tape as required by using the accessory Recorder-Reproducer Set, Sound AN/PNH-5 (tape recorder) supplied with the receiver. The AN/PNH-5 Tape Recorder is capable of three hours of recording. A playback function is also provided so that the recording can be audited at the operator's convenience. When the taped message is no longer required at the site, it can be stored for permanent record, or it can be erased and a new recording made. Reception capabilities in the amplitude-modulated range extend from 0.54 MHz to 205 MHz and the frequency-modulated range is from 15 MHz to 205 MHz.

c. Two interchangeable power supplies are furnished with the receiver. The first is Battery Power Supply PP-4833/PRR-15, which provides for portability. The second is a regulated supply, Power Supply PP-4834/PRR-15, which operates from a 120 volt source at line frequencies between 50 and 400 Hertz and is used when battery operation is not required. This regulated supply also permits operation from a 24 volt dc source. Provisions are made within the receiver for monitoring signal strength, checking battery condition, activating the automatic frequency control circuit, activating a beat frequency oscillator circuit, lighting the dial face, and, through the use of a microphone, annotating the recorded tape with voice signals.

d. A portable fiber glass case houses the receiver chassis, battery power supply and tape recorder. A similar fiber glass case houses the accessories, which are listed in Table 1-2.

1-3. DESCRIPTION OF UNITS.

a. RECEIVER, RADIO R-1484/PRR-15. - The receiver (Figure 1-2) consists of the receiver described in this paragraph, the outer case described in paragraph b., and Battery Power Supply PP-4833/PRR-15 described in paragraph c. The receiver uses modular construction with the modules installed on an open-type aluminum framework. Module construction lends itself to simplified maintenance thus minimizing maintenance downtime.

(1) The receiver case also contains the tape recorder and a power supply. All operating controls are located on the receiver front panel. Facilities are incorporated for operation with a whip antenna or wire antenna, and for operation with a direction finder.

(2) Operating power for the receiver is supplied from either Battery Power Supply PP-4833/PRR-15, or Power Supply PP-4834/PRR-15 (regulated). The battery power supply is in the receiver case when initially shipped from the factory and the regulated power supply is stored in Accessory Case CY-6237/PRR-15.

b. CASE AND CARRYING STRAP. - The receiver case is constructed of a fiber glass material, and consists of the main case and a cover. The cover is held to the main case by four clamps. A relief valve on the bottom of the case is used to equalize pressure before the cover is removed. An antenna mount is located at the center of the cover and is used to support a 9 foot whip antenna. A pocket is supplied inside the cover for storing adapters or other small miscellaneous items.

(1) The case itself has a web handle for hand-carrying, and packboard mounting brackets for attaching to a packboard (see Figure 1-3). The upper compartment houses the receiver and the lower compartment contains the tape recorder and either the regulated power supply, or the battery power supply. Power supply output is applied to the receiver through a connector mounted inside the case

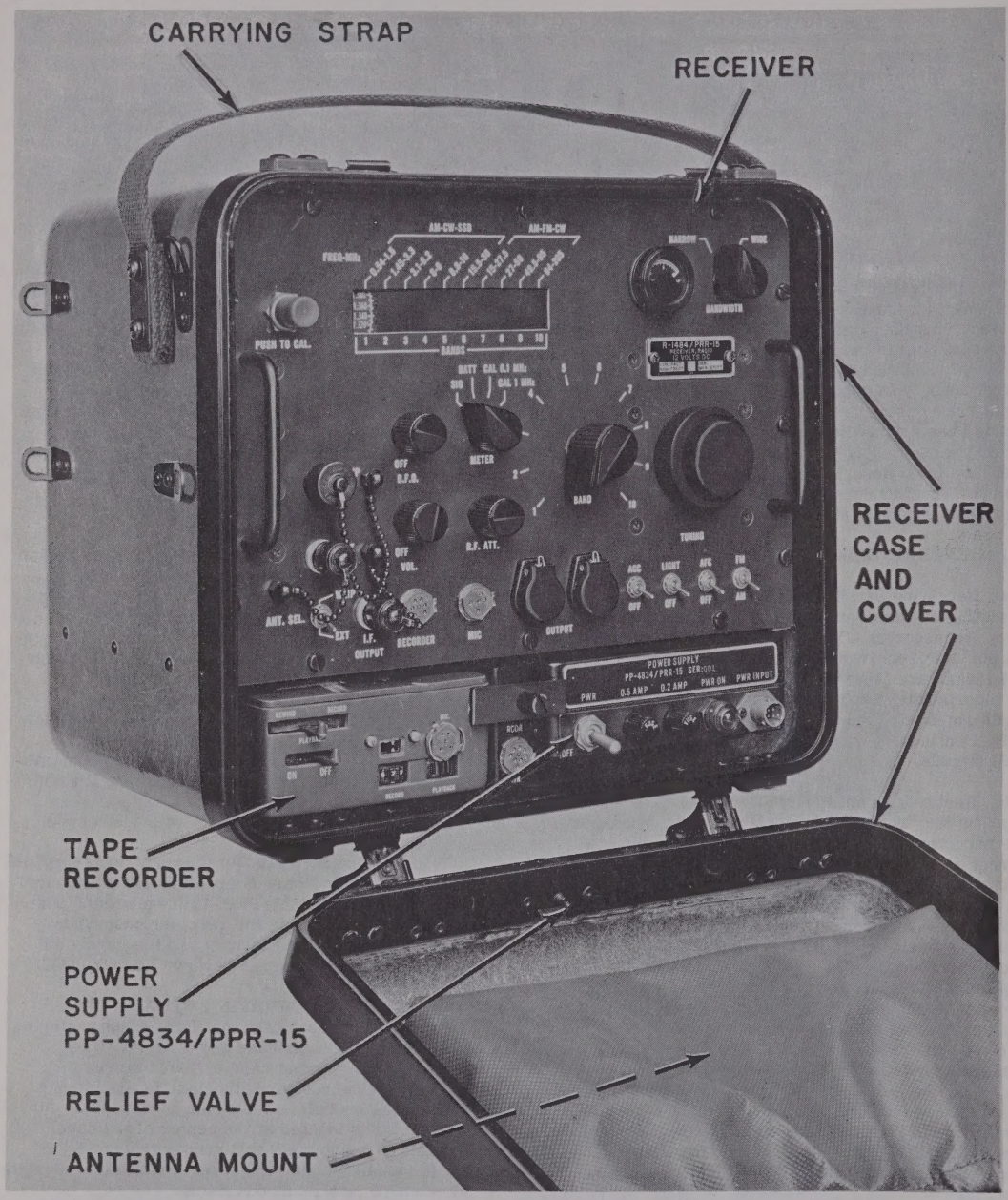


Figure 1-2. Receiver, Radio R-1484/PRR-15

at the lower right rear section. A connector at the lower center of the case allows the tape recorder to be operated from the receiver power supply.

c. BATTERY POWER SUPPLY PP-4833/-PRR-15. - The battery power supply (see Figure 1-4) is a two-piece plastic container into which eight "D" size batteries or nine "C" size batteries can be housed, which then supply either 12 volts direct current or 13.5 volts direct current, respectively, to the receiver. The two sections are held together by

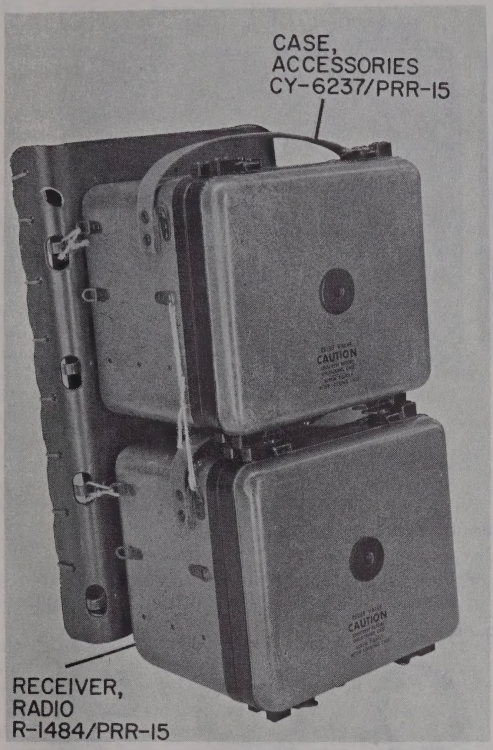
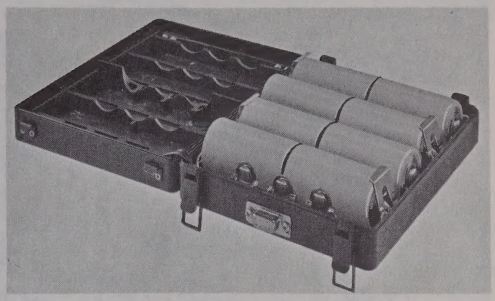


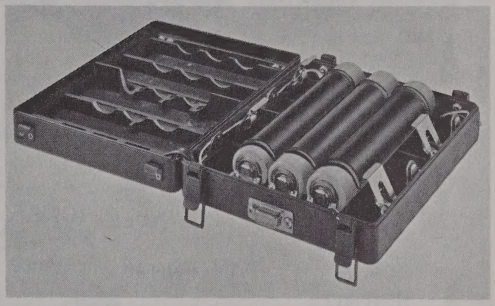
Figure 1-3. Receiving Set, Radio AN/PRR-15, Mounted on Packboard

four latches, two at each end. When the latches are open the two sections can be separated to allow for changing of batteries. In the open position the two sections are held together by a neoprene ring. The battery power supply is inserted into the lower right compartment of the receiver case and completes an electrical circuit to the receiver through a connector on the rear of the power supply, and a connector at the inside lower right section of the receiver case.

d. POWER SUPPLY PP-4834/PRR-15 (REGULATED). - Power Supply PP-4834/PRR-15 (Figure 1-5) operates from either 120 volts alternating current, 50 to 400 Hertz, a single phase source, or a 24 volts dc source. It consists of rectifier and regulator circuits to provide the 12 volt dc output for receiver operation. The power supply is contained in a plastic case inserted into a compartment at the lower right of the receiver housing. The supply is connected to the 120 volt alternating current line by means of a 10 foot cable, or to a 24 volt dc jeep battery by means of a 15 foot cable. Provisions are incorporated in the power supply to prevent damage by accidental reversal of 24 volt battery polarity. A PWR ON indicator lamp, PWR-OFF (power on-off) switch and fuses are located on the power supply front panel.



"D" Size (8-Req'd)



"C" Size (9-Req'd)

Figure 1-4. Battery Power Supply, PP-4833/PRR-15

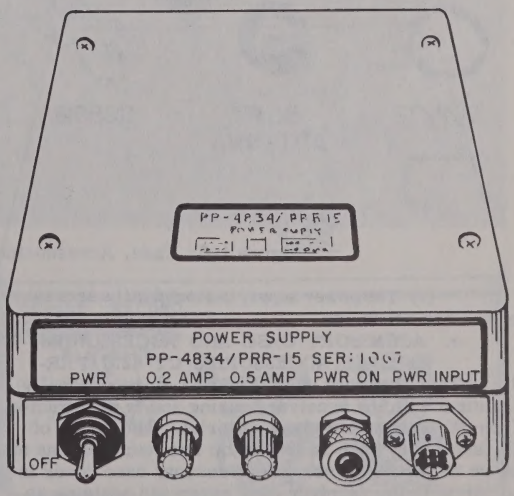


Figure 1-5. Power Supply, PP-4834/PRR-15

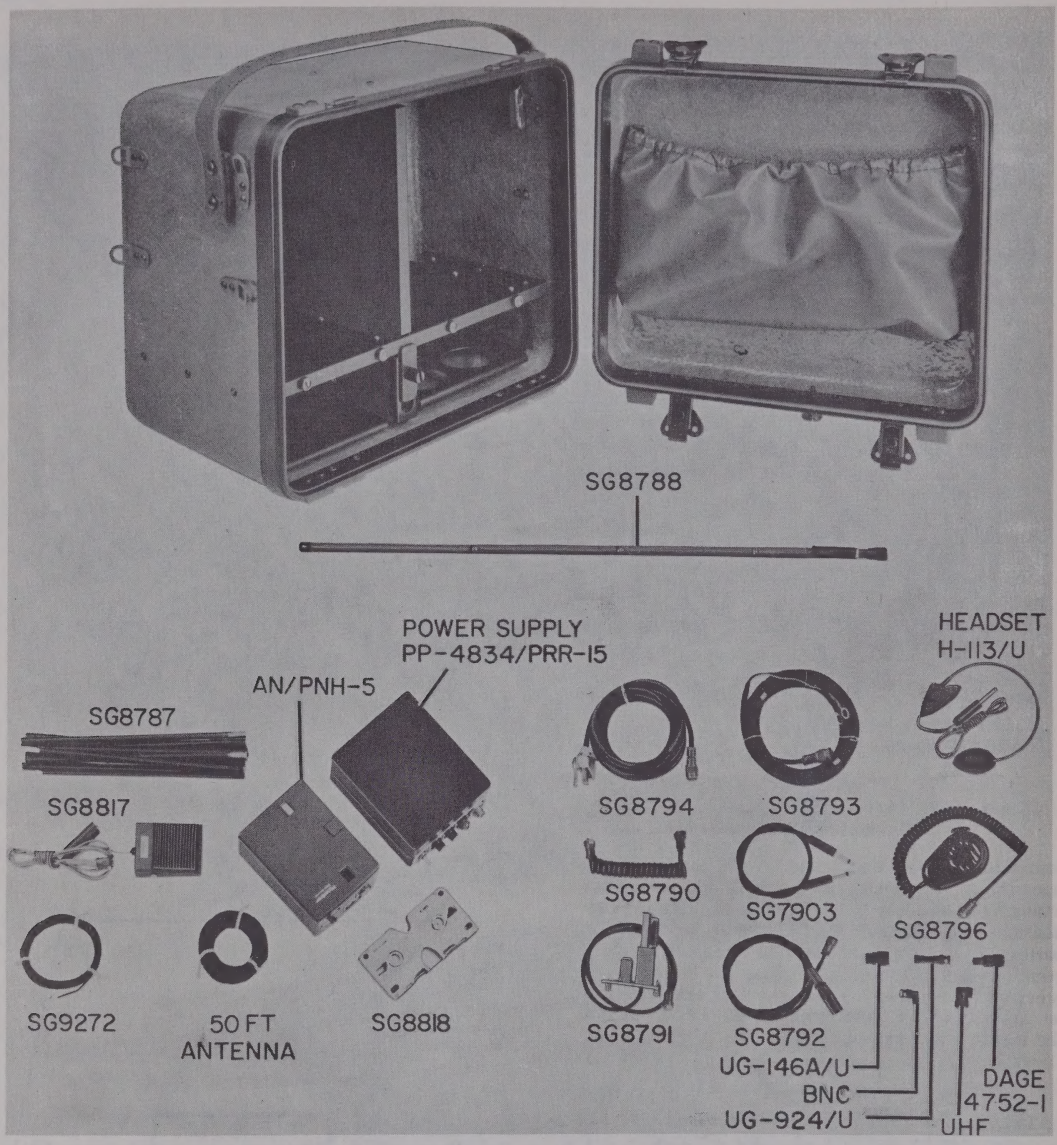


Figure 1-6. Case, Accessories CY-6237/PRR-15 with Accessories

(1) The power supply is stored in the accessory case when not in use.

e. ACCESSORY CASE AND ACCESSORIES.

(1) CASE, ACCESSORIES CY-6237/PRR-15. - The accessory case (Figure 1-6) is externally identical with the receiver housing and is constructed from the same fiber glass material. The inside of the accessory case is divided up into four sections to store the accessories. The accessory case cover is identical to the receiver case cover and contains an antenna support bracket. An internal pocket is provided for storage of miscellaneous items.

(2) WHIP ANTENNAS. - Two whip antennas are provided with the receiver. These are a 9 foot sectional antenna, and 30 inch tape antenna. The 9 foot whip antenna consists of 10 tubular aluminum sections. It is normally mounted to the antenna support on the cover of the receiver case. Connection to the antenna input on the receiver is by a 15 foot length of wire, or, the antenna may be mounted directly to the receiver through a right-angle adapter. The antenna is terminated in a UHF male RF connector.

The 30 inch tape whip antenna may be stored

in the receiver case or accessory case. It mounts directly into the antenna input of the receiver through a right-angle adapter. This antenna is terminated in a UHF male RF connector.

(3) CABLES. - Six cables are supplied (see Figure 1-6). These are -

(a) A 10 foot cable, SG8794, used to connect the regulated power supply to a 120 volt ac outlet.

(b) A 15 foot cable, SG8793, used to connect the regulated power supply to a 24 volt dc jeep battery.

(c) A 4 foot shielded cable, SG8792, used to connect Tape Recorder, AN/PNH-4, (not supplied with the receiving set) to the receiver output.

(d) A 4 foot cable, SG8791, used to connect Tape Recorder AN/PNH-5 to the receiver case when it is necessary to operate the tape recorder from the receiver power supply.

(e) A cable, SG8790, for connecting the Tape Recorder AN/PNH-5 to the receiver.

(f) A shielded cable, SG7903, used to patch output of two receivers together for application to a single tape recorder or headset.

(4) MICROPHONE. - The microphone allows the operator to add comments to the recording of the receiver output, or to simply record information.

(5) WIRE ANTENNAS. - Two lengths of Number 20 AWG wire are provided which can be used as long wire antennas. One wire is 15 feet long and the second wire is 50 feet long. The 15 foot length of wire may also be used to connect the 9 foot whip antenna to the receiver when the whip antenna is mounted on the case cover. This wire has a lug attached to one end which is attached to the 9 foot whip antenna when the antenna is mounted on the antenna support of the receiver or accessory case cover.

(6) ADAPTER AND ELBOWS. - Three adapters and two right-angle coaxial elbows are supplied. The adapters types are a UG-146A/U, a UG-924/U, and a Dage type 4752-1. The UG-924/U is used to connect a wire antenna to the EXT ANT input on the front panel of the receiver and consists of a BNC connector on one end and a binding post on the other end. The Dage 4752-1 is used to connect a wire to the WHIP ANT input on the receiver front panel and consists of a small UHF connector on one end and a binding post at the other end.

(a) The two right angle coaxial elbows UG-306 and M359A, 49192 are to connect and support the antenna connected to WHIP ANT input.

(7) HEADSET. - The headset supplied is a type H-113/U. An extension cord SG9348 is required to mate with receiver OUTPUT connector.

(8) TAPE RECORDER. - Each receiving set is supplied with either one or two AN/PNH-5 Tape Recorder, (Figure 1-7), and two tape magazines are supplied for each recorder. The spare magazines are stored in the accessory case.

(a) The tape recorder may be stored in the accessory case or in lower left section of the receiver case. Instructions for operation and maintenance of the tape recorder are available in the tape recorder service manual shipped with each AN/PRR-15. The tape recorder contains its own batteries for operation, or the tape recorder may be operated from the receiver power supply through a cable which is attached between the tape recorder and the receiver case. All operating controls for the tape recorder are located on the front panel of the tape recorder. When the tape recorder is used independently from the receiver, energizing of the motor circuit requires that the tape recorder ON-OFF switch be in the ON position; also, the microphone switch located on the microphone must be closed.

(b) When the recorder is used with the receiver only the ON-OFF switch on the tape recorder is required to be in the ON position to energize the motor circuit. The microphone switch then serves the purpose of disabling the receiver audio output and allows operator comments to be incorporated onto the tape.

(9) PEDAL TRANSCRIBER. - One transcriber pedal is supplied with each receiving set and is used to remotely operate the tape recorder with the operator's foot. A headset jack is provided on the foot pedal assembly to connect a headset for monitoring tape recorder output.

(10) BATTERY HOLDER. - Three battery holders are required to maintain alignment of the "C" size batteries when used. These holders may be stored in the pocket of either accessory case or the receiver case.

1-4. REFERENCE DATA.

Reference Data for Receiving Set, Radio AN/PRR-15 is listed in Table 1-1.

1-5. EQUIPMENT SUPPLIED.

Equipment shipped by the contractor with Receiving Set, Radio AN/PRR-15, including accessories and technical manuals, is listed in Table 1-2. The weight and overall dimensions of each unit includes handles and latches.

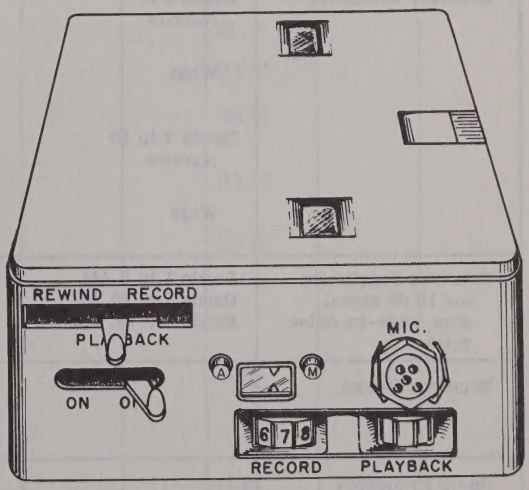


Figure 1-7. Recorder Reproducer Set, AN/PNH-5

1-6. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

All equipment required for a complete operational installation of Receiving Set, Radio AN/PRR-15 (but not supplied by the contractor) is listed in Table 1-3.

1-7. PREPARATION FOR RESHIPMENT.

The complete equipment with accessories, but not including technical manuals, is housed in two watertight cases. No special preparations are necessary for shipment except to check that all equipment supplied as listed in Table 1-2 is properly stored in the respective areas of the accessory case or receiver case. Space is available within the accessory case to store spare batteries (not supplied).

TABLE 1-1. RECEIVING SET, RADIO AN/PRR-15, REFERENCE DATA

ITEM	TECHNICAL DATA	
	FUNCTION	CAPABILITY AND LIMITS
Input Power Sources		(a) 8 type BA-30/U, or 9 type BA-42/U housed in Battery Power Supply PP-4833/PRR-15 (b) 24 volt battery used with Regulated Power Supply PP-4834/PRR-15 (c) 120 volt alternating current ±10%, 50 to 400 Hertz ±10%, single phase with Regulated Power Supply PP-4834/PRR-15
Frequency Range	Range of Band 1 Range of Band 2 Range of Band 3 Range of Band 4 Range of Band 5 Range of Band 6 Range of Band 7 Range of Band 8 Range of Band 9 Range of Band 10	0.540 MHz - 1.500 MHz 1.450 MHz - 3.300 MHz 3.100 MHz - 6.200 MHz 6.000 MHz - 9.000 MHz 8.800 MHz - 16.00 MHz 15.50 MHz - 30.00 MHz 15.0 MHz - 27.5 MHz 27.0 MHz - 50.0 MHz 49.5 MHz - 95.0 MHz 94.0 MHz - 205.0 MHz
Intermediate Frequency	Bands 1 to 4 Bands 5 and 6 Bands 7 to 10	455 kHz 2.9 MHz & 455 kHz Double Conv. 10.7 MHz
Type of Reception	Bands 1 to 6 Bands 7 to 10	A1, A2, A3 A1, A2, A3, F3
Receiver Selectivity	Bands 1 to 6 Narrow Wide Bands 7 to 10 Narrow Wide	 6.0 kHz at 6 db down 13.0 kHz at 60 db down 10.0 kHz at 6 db down 20.0 kHz at 60 db down 40.0 kHz at 6 db down 60.0 kHz at 40 db down 120.0 kHz at 6 db down 490.0 kHz at 40 db down
Receiver Sensitivity for 10 db signal plus noise-to-noise ratio	Bands 1 to 6 AM Bands 7 to 10 AM Bands 7 to 10 FM	5.0 microvolts or less 10 microvolts or less 10 microvolts or less for 15 kHz deviation at 1 kHz modulation (10 dn S/N)
Receiver Output		(a) 200 milliwatts into 3.2 ohm load (b) 50 milliwatts output into 600 ohms, with minimum level RF input
Audio Frequency		300 to 3000 Hertz, maximum deviation 6 db with respect to 1700 Hertz

TABLE 1-1. RECEIVING SET, RADIO AN/PRR-15, REFERENCE DATA (CONT'D)

ITEM	TECHNICAL DATA	
	FUNCTION	CAPABILITY AND LIMITS
Service Condition Limitations (Operating)	Temperature Altitude Humidity	-30°C (-22°F) to +55°C (+130°F) Sea level to 15,000 feet 0 to 90% relative
Service Condition Limitations (Non-Operating)	Temperature Altitude Humidity	-62°C (-80°F) to +71°C (+160°F) Sea level to 30,000 feet 0 to 80% relative

TABLE 1-2. EQUIPMENT AND PUBLICATIONS SUPPLIED

QTY PER EQUIP	NOMENCLATURE		OVERALL DIMENSIONS (In.)				VOLUME (cu ft)	WEIGHT (lb)
	NAME	DESIGNATION	UNIT NO.	HEIGHT	WIDTH	DEPTH (LENGTH)		
1	Receiving Set, Radio	AN/PRR-15	1					41
	Consists of:							
1	Receiver, Radio	R-1484/PRR-15	A1					
1	Receiver Case		A2	11.5	13.5	10.75	0.968	20
1	Regulated Power Supply	PP-4834/PRR-15	A3	2	5.5	8		
1	Battery Power Supply	PP-4833/PRR-15	A4	2	5.5	7		
1	Case, Accessory	CY-6237/PRR-15	2	11.5	13.5	10.75	0.968	21
1	Whip Antenna	SG8787				(9 ft)		
1	Whip Antenna	SG8788				30		
1	Wire Antenna	SG9349				(15 ft)		
1	Wire Antenna	52G3064				(50 ft)		
1	Cable, Power 24 vdc	SG8793				(15 ft)		
1	Cable, Power 120 vac	SG8794				(10 ft)		
1	Cable, Receiver, Recorder	SG8790						
1	Cable AN/PNH-4, Interconnection	SG8792				(4 ft)		
1	Cable, dual Receiver	SG7903						
1	Cable Recorder Power	SG8791				(4 ft)		

TABLE 1-2. EQUIPMENT AND PUBLICATIONS SUPPLIED (CONT'D)

QTY PER EQUIP	NOMENCLATURE		OVERALL DIMENSIONS (In.)				VOLUME (cu ft)	WEIGHT (lb)
	NAME	DESIGNATION	UNIT NO.	HEIGHT	WIDTH	DEPTH (LENGTH		
1	Cable Extension, Earphone	SG9348						
1	Microphone	SG8796						
1	Adapter	UG-146A/U						
1	Adapter	UG-924/U						
1	Adapter	Dage 4752-1						
1	Elbow Coaxial right angle BNC	UG-306						
1	Elbow Coaxial right angle UHF (small)	M359A, 49192						
1	Headset	H-113/U						
1 or 2*	Tape Recorder	(AN/PNH-5)						
1*	Foot Pedal	SG8817						
1	Holder, Battery	17G3154						
2 or 4*	Tape Magazine							
1	Tech Manual	TM-05599A-15		8.25	10.75	1		
1*	Service Manual Dictet Recorder	NS-7						

*These items are shipped with the equipment but are supplied by the Government.

Notes: 1. Volume and weight specified only for Receiver and Accessory Case.

2. Designations for units not assigned an official nomenclature are the manufacturer's part numbers.

TABLE 1-3. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

QTY PER EQUIP	NOMENCLATURE		REQUIRED USE	RECEIVER, RADIO R-1484/PRR-15 EQUIPMENT CHARACTERISTICS
	NAME	DESIGNATION		
8 or 9	Battery Battery	BA-30/U BA-42/U	Power Source Power Source	12 volt input 13.5 volt input
1	Electronic Voltmeter	AN/PSM-4D	Troubleshooting & Maintenance	Voltages DC 0-100v AC 0-150v Resistance 0 to 10 meg ohms Impedance 10 meg ohms Frequency 50 to 100,000 Hz
1	Signal Generators	AN/URM-48 HP606 HP608C HP3211A W/HP3212A Plug-in	Troubleshooting & Maintenance	455 kHz to 220 MHz
1	Audio Power Meter	TS-585D/U	Troubleshooting & Maintenance	0 to 200 millivolts min range 3.2 ohm input impedance
1	Multimeter	ME 6D/U	Troubleshooting & Maintenance	Voltages DC 0-100v AC 0-150v Impedance 20,000 ohm/v Resistance 0 to 10 meg ohms
1	Counter	CP-843(P)/U	Troubleshooting & Maintenance	Frequency check of Signal Generators
1	Oscilloscope	AN/USM-117	Troubleshooting & Maintenance	FM alignment
1	Audio Generator	HP-200AB	Troubleshooting & Maintenance	Audio frequency and distortion tests 300 to 3000 Hertz sine wave

SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING.

Components of Receiving Set, Radio AN/PRR-15 are packed in two cardboard cartons which in turn are contained in one large carton and protected by waterproof paper wrappings and cardboard fillers. The equipment should be unpacked with care and a visual inspection made for evidence of damage which might have occurred in transit. Check the equipment against the shipping list to verify the complete complement.

2-2. POWER REQUIREMENTS.

The receiver is designed to operate either from Battery Power Supply PP-4833/PRR-15 or (Regulated) Power Supply PP-4834/PRR-15. Battery Power Supply PP-4833/PRR-15 is a battery pack. Battery Voltage will vary depending on the type of cells used. When type "C" cells (BA-42/U) are used, 9 cells are required which provide 13.5 volts. When type "D" cells (BA-30/U) are used, eight cells are required which provide 12 volts. Power Supply PP-4834/-PRR-15 provides an operating flexibility allowing the receiver to operate from a 120v ac 50 to 400 Hertz single-phase source, or from a 24 volt dc source.

All batteries used in the system are listed in Table 2-1, and equivalent batteries are listed in parentheses. Standard zinc-carbon size C or D cells may be used in the receiver; however, there will be an appreciable decrease in battery operating life. The distribution of the 12 to 13.5 volt primary power is shown in Figure 2-1.

2-3. SITE SELECTION.

Receiving Set, Radio AN/PRR-15 is a man-pack portable receiver which will operate in almost any type of environment; therefore, specific information on site selection cannot be given. Information on actions the operator can take to obtain the maximum capabilities of the equipment is detailed in paragraph 2-4.

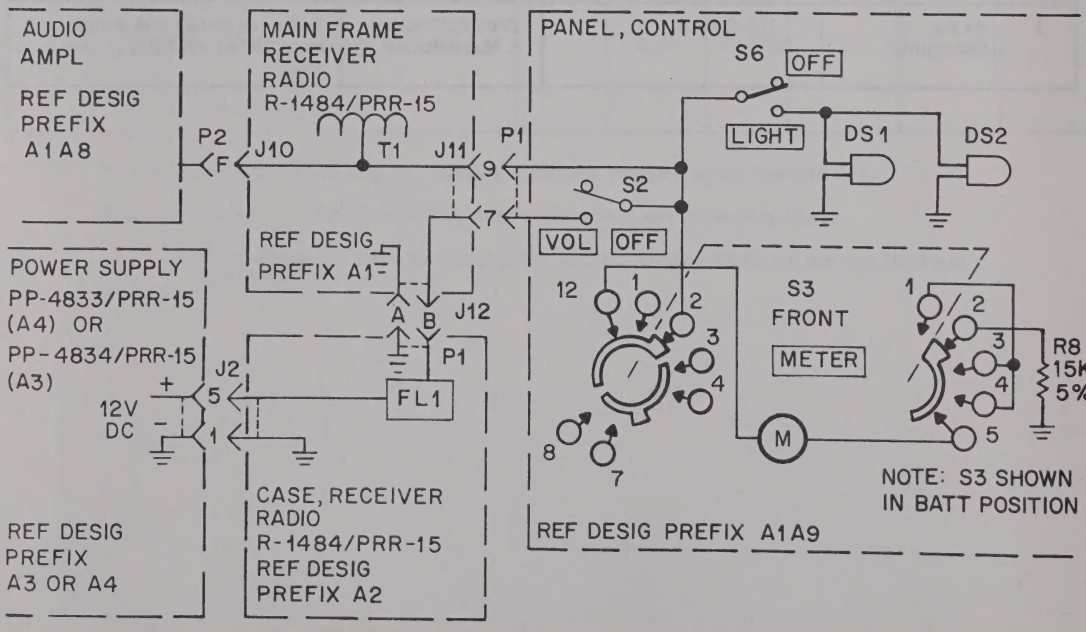


Figure 2-1. Primary Power Distribution Schematic Diagram

2-4. INSTALLATION REQUIREMENTS.

Due to the portability of the equipment, there may be times when it is necessary to operate in areas that do not provide the best location for reception. To ensure maximum efficiency of the equipment, the following list of suggestions is provided. This list will enable the operator to obtain the best possible reception under adverse conditions.

a. Try to locate the receiver as far away from interference sources such as motors, generators, power stations, etc., as is possible.

b. Use the proper antenna, which is to be selected in accordance with the specific requirement, as listed in Section 3.

c. If a long-wire antenna is used, mount it as high as possible and away from all structures.

d. Place the receiver on a flat surface.

e. Do not locate the receiver in an area where there is excessive dust, dirt, or moisture without providing some protection for the receiver.

f. Install the batteries and connect the applicable power supply as instructed in Section 3.

g. Perform an operational test; the receiver will then be ready for operation.

2-5. CABLE ASSEMBLIES.

All cables required for normal operation are supplied with the equipment. A list of these cables is given in Table 2-2; this list can be used as an aid in repairing faulty cables, or in constructing new cables.

2-6. INSPECTION AND ADJUSTMENTS.

a. INSPECTION. - The following inspection will be performed immediately after all components have been unpacked:

(1) Visually check to see that all packing materials have been removed from each component.

(2) Check the receiver for loose knobs or parts.

(3) Check the receiver and accessories thoroughly for any damage that might have occurred during shipment.

(4) If any damage is found, submit an unsatisfactory equipment report in accordance with established procedures.

(5) Compare the unpacked equipment against the packing slip or the list of equipment supplied (Table 1-2).

b. ENERGIZING EQUIPMENT FOR FIRST TIME. - The equipment is shipped complete and ready to operate, with the exception of batteries. All internal adjustments are made at the factory and no further adjustments are necessary. Instructions for battery installation are provided in paragraph 3-10.

c. PREOPERATIONAL TESTS. - Although the receiver has been fully aligned, adjusted and tested at the factory, it is essential to retest it before it is placed in service. This will ensure that all components of the system are in proper operating condition, and that no damage has occurred during shipment. Perform these procedures:

Step 1. Install Power Supply PP-4834/PRR-15 in receiver and connect equipment as shown in Figure 2-2, using the HP-606A Signal Generator.

Step 2. Set all controls on equipment as indicated in Table 2-3.

Step 3. Place power supply ON-OFF switch to ON, red light on power supply shall be illuminated.

Note

If not illuminated, check dimmer on light assembly; also check fuses.

Step 4. Observe meter on receiver for an indication in the green (good) area indicating proper voltage to the receiver.

TABLE 2-1. BATTERIES REQUIRED

UNIT	NO. TYPE	VOLTAGE	NOMENCLATURE
Receiver	8 Carbon-Zinc or Manganese-Alkaline size "D" cells	12v 1.5v ea	Zenith Z-4NL (Eveready 1150) (Mallory MN-300) (BA-30/U)
	9 Carbon-Zinc or Manganese-Alkaline size "C" cells	13.5v 1.5v ea	Zenith Z-7 (Eveready 935) (Mallory M-14F) (BA-42/U)
Recorder			
a. Motor	2 Mercury Batteries	8.10v	Dictaphone 103293 (Eveready E136) (Mallory TR-136R)
b. Amplifier	1 Mercury Battery	6.75v	Dictaphone 103292 (Eveready E115) (Mallory TR-115R)

Step 5. Hold LIGHT-OFF switch in the LIGHT position. Observe dial illumination.

Note

Dial illumination shall be visible in low ambient light level.

Step 6. Turn on signal generator and set for AM, 540 kHz, modulated 30% at 1000 Hz, at an output level of 10 microvolts (μv).

Step 7. Set VOL control to midrange.

Step 8. Set METER switch to SIG position.

Step 9. Adjust TUNING control to obtain maximum output at approximately 540 kHz.

Step 10. Vary VOL control through range and check that output level changes as a function of control position.

Step 11. Set VOL control to midrange; adjust RF ATT control and check that output level varies as a function of control rotation.

Step 12. Set AGC-OFF switch to AGC and vary signal generator input from 20 microvolts to 2,000 microvolts. Output shall not vary over 6 db.

Step 13. Set VOL control to midrange.

Step 14. Set receiver tuning to 1.500 MHz at high end of band 1.

Set signal generator for 10 microvolts output at same frequency and check that output on power meter is at least 100 milliwatts.

Step 15. Turn signal generator off then tune receiver to approximately 1.000 MHz on band 1.

Step 16. Set METER switch to CAL 0.1 MHz and set BFO control to midrange.

Step 17. Rock tuning control back and forth about the 1.000 MHz position to obtain a zero beat. (Null indication on audio power meter)

Step 18. Set METER switch to CAL 1.0 MHz and again locate zero beat. If zero beat does not occur at exactly 1.000 MHz on band 1, adjust TUNING for a dial indication of 1.000 MHz, then press and hold PUSH TO CAL BUTTON and at the same time adjust TUNING for a zero beat.

Note

This procedure aligns dial indication with actual frequency.

Step 19. Set receiver BAND switch and TUNING as indicated in Table 2-4. Set signal generator to receiver frequency at 10 microvolts input, then check output meter for a minimum 100 milliwatts output. Use the HP-608C for bands 8, 9 and 10.

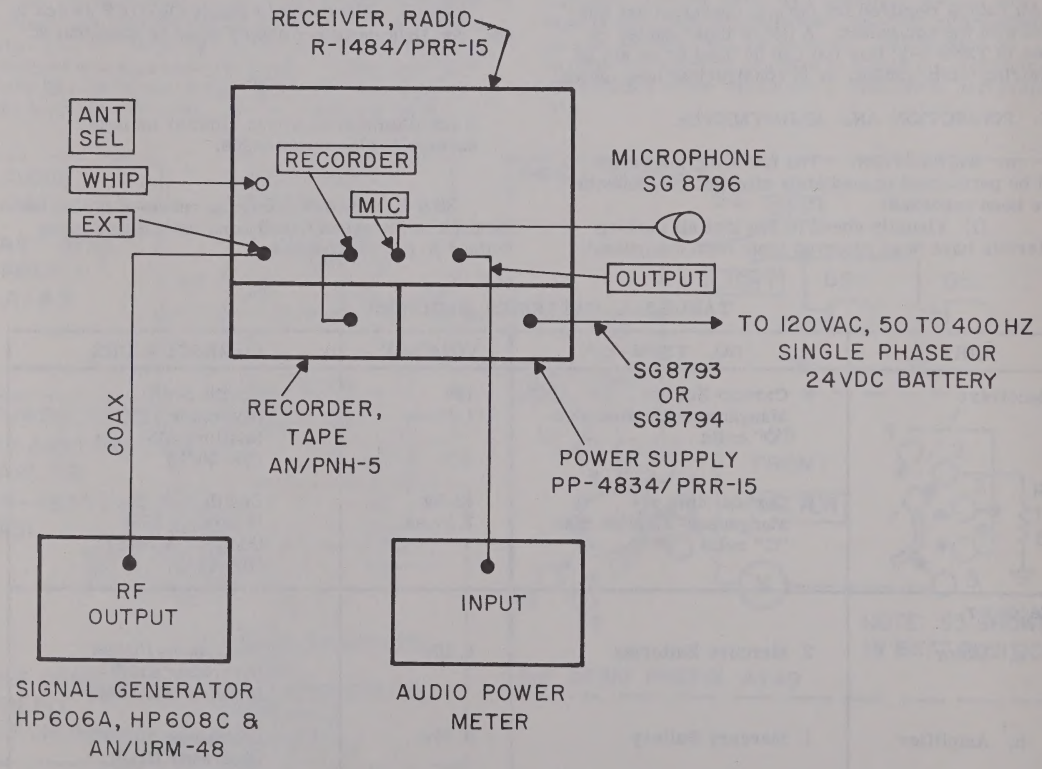


Figure 2-2. Preoperational Check Test Setup

TABLE 2-2. CABLE DATA

MFR CABLE NO.	NO. ACTIVE CONDUCTORS	FROM	TYPE CONNECTOR	TERMINAL OR PIN NO.	WIRE COLOR	TO	TYPE CONNECTOR	PIN NO.	WIRE SIZE	FUNCTION	REMARKS
SG8792	2	Receiver	MS24040-1	A B C D E F H		Recorder not supplied as part of AN/PRR-15 (4 ft)	Zenith Number 58G3087	 3 1 and 2	RG-108A/J	 Audio signal Audio return	Special cable for certain type of recorders
SG8793	2	Power Supply PP-4834/ PRR-15	MS31168-4SW	A B C D	 White Black	Battery (15 ft)		 Plus side battery Minus side battery	 20AWG 20AWG	 +24 vdc GND	Used when 24-volt jeep battery is used as power source
SG7903	2	Receiver	Zenith Number 58G3076	Inside Outside	 Black	 Receiver (2 ft)	Zenith Number 58G3076	Inside Outside	20AWG 20AWG	Audio signal Audio return	Used to patch two receiver outputs together
SG8791	2	Receiver	MS24056-2	A B C D E F G J K		Recorder (2-1/2 ft)	Zenith Number 52G3091				Used to supply 12vdc from receiver to tape recorder motor

TABLE 2-2. CABLE DATA (CONT'D)

MFR CABLE NO.	NO. ACTIVE CONDUC-TORS	FROM	TYPE CONNEC-TOR	TERMI-NAL OR PIN NO.	WIRE COL-OR	TO	TYPE CONNEC-TOR	PIN NO.	WIRE SIZE	FUNCTION	REMARKS
SG8790	4	Receiver	MS24040-1	A			MS24038-2	A		Recorder Motor	Used to connect receiver to Dictet Tape recorder
				B		Recorder		B		Recorder Motor	
				C							
				D							
				E		(3 ft)		E		Audio Signal	
				F							
				H				H		Audio Return	
SG8794	2	Power Supply PP-4834/ PRR-15	62G3198	A	White		MS24663		20AWG	120vac	Used to connect power supply to ac line
				B							
				C	Red	AC Power Source			20AWG	120vac Return	
				D	Black	(11 ft)		GRD BLADE	20AWG	GRD	

TABLE 2-3. PRELIMINARY CONTROL SETTING

CONTROL	LOCATION	POSITION
METER	Receiver	BATT
BAND	Receiver	1
TUNING	Receiver	0.540 kHz
BFO	Receiver	OFF
VOL	Receiver	ON
RF ATT	Receiver	MID Range
AGC-OFF	Receiver	OFF
LIGHT-OFF	Receiver	OFF
AFC-OFF	Receiver	OFF
FM-AM	Receiver	AM
BANDWIDTH	Receiver	NARROW
POWER ON-OFF	Power Supply	OFF
ON-OFF	Tape Recorder	OFF
PLAYBACK	Tape Recorder	MID Range
REWIND-PLAYBACK-RECORD	Tape Recorder	PLAYBACK
RECORD	Tape Recorder	MID Range

TABLE 2-4. RECEIVER FREQUENCY SETTING

STEP	BANDSWITCH	TUNING
A	2	1.450MHz
B	2	3.300 "
C	3	3.100 "
D	3	6.200 "
E	4	6.000 "
F	4	9.000 "
G	5	8.800 "
H	5	16.00 "
I	6	15.50 "
J	6	30.00 "
K	7	15.00 "
L	7	27.50 "
M	8	27.00 "
N	8	50.00 "
O	9	49.50 "
P	9	95.00 "
Q	10	94.00 "
R	10	205.00 "

Step 20. Disconnect HP-606C and connect AN/-URM-48 and set signal generator to FM.

Step 21. Set FM generator for center frequency of 50 MHz modulated at 1,000 Hz with a 15 kHz deviation at a level of 100 μv.

Step 22. On receiver, set FM-AM switch to FM, AGC to OFF, BAND switch to 8 and adjust TUNING for a dial indication of 50 MHz.

Step 23. Readjust FM generator center frequency for maximum output on output meter.

Step 24. Increase FM generator center frequency until output drops to 25 milliwatts.

Step 25. Set AFC-OFF switch to AFC; output shall rise to 100 milliwatts minimum.

Step 26. Set AFC-OFF switch to OFF and adjust signal generator to the frequency below 50 MHz where the output again indicates 25 milliwatts.

Step 27. Set AFC-OFF switch to AFC; the output of the receiver shall again rise to 100 milliwatts minimum.

Step 28. Install tape recorder loaded with a tape cartridge as indicated in paragraph 3-6 and set tape recorder for recording.

Step 29. Set receiver controls to preliminary positions indicated in Table 2-3 and turn on Power Supply PP-4834/PRR-15.

Step 30. Set signal generator for 540 kHz, modulated with 1,000 Hz, 30 percent at an output level of 100 microvolts.

Step 31. Adjust receiver volume for 100 milliwatts output.

Step 32. Record output of receiver on tape for a period of 30 seconds.

Step 33. Press microphone button on microphone and record a comment, then release microphone button.

Step 34. Rewind and playback recorded tape following procedures in paragraph 3-6c and 3-6d to assure proper operation of tape recorder, microphone, and associated circuits.

2-7. INTERFERENCE REDUCTION.

If the equipment must be operated where excessive interference is present, mount the antenna as far away from the source of interference as is possible and connect the receiver to the antenna through a coaxial cable. No other interference reduction procedures are possible. For best operation, follow the instructions in paragraph 3-2c for antenna placement.

SECTION 3

OPERATION

3-1. PRINCIPLES OF OPERATION.

Receiving Set, Radio AN/PRR-15 will operate as a fixed station (in one position), as a mobile unit (in a motorized vehicle), or as a mancarried unit; and will receive amplitude modulated (AM) continuous wave (CW), single sideband (SSB) or frequency modulated (FM) signals. Circuitry within the receiver provides the beat signal for reception of CW signals (code) or single sideband signals. A ten band switching arrangement covering 0.54 MHz to 205 MHz is used. The equipment can operate in the following modes.

a. Receiver only, with external speaker or headphones.

b. Recorder only, to record messages from the operator.

c. Receiver and recorder; to record messages from the receiver or operator (AM or FM, voice, or CW).

d. External mode; connections are provided for connecting to an AN/TNH-4 or AN/PNH-4 Tape Recorder.

e. Radio direction-finding, for use with a direction-finding antenna and detector.

f. Diversity operation, by using two receivers.

(1) Two of the most popular modes of operation are AM or FM voice transmissions and CW, which is used for code transmissions. Each type of transmission has its advantages and disadvantages. In addition to the desired signals, the operator will also receive non-intelligent signals created by jamming devices, or transmitters. These signals are noise modulated, and are used to render reception difficult if not impossible. There is no known method of reducing these signals to improve the desired signal. However, the operator must learn to distinguish between jamming signals, atmospheric disturbances, electrical noise, and noise caused by a defect within the receiver.

(2) No receiver is any better than the antenna to which it is connected. For this reason it is also necessary to understand some principles of antenna installation.

(3) Electromagnetic waves are radiated into space each time a transmission takes place and will produce a signal in the receiving antenna.

(4) In area where the signal is strong it is possible to have good reception with almost any type of antenna regardless of its height or direction. However, in weak signal areas it will be desirable to select the proper antenna. Mount the antenna above all structures and vegetation when possible. These precautions will ensure a maximum signal with a minimum of electrical interference.

3-2. PREPARATION FOR USE.

a. POWER SUPPLY SELECTION. - The Receiving Set, Radio AN/PRR-15 is supplied with two power supplies. These are the Battery Power Supply PP-4833/PRR-15 and the (Regulated) Power Supply PP-4834/PRR-15.

(1) POWER SUPPLY PP-4833/PRR-15. - This power supply operates from either eight "D" size batteries or nine "C" size batteries and is used when power service for Power Supply PP-4834/PRR-15 is not available. Installation of batteries is described in paragraph 3-10.

(2) POWER SUPPLY PP-4834/PRR-15. - This power supply operates from either a 120 volt alternating current, 50 to 400 Hz, single phase source or from a 24 volt direct current source.

b. POWER SUPPLY INSTALLATION. - Both power supplies are installed in the receiver housing in the same manner as shown in Figure 3-1 and in accordance with the following procedure:

Step 1. Unlatch the front cover from the fiber glass housing of the receiver.

Step 2. Loosen the retainer at the lower center of the receiver housing.

Step 3. Insert either the Battery Power Supply PP-4833/PRR-15 into receiver, or Regulated Power Supply PP-4834/PRR-15 into receiver as shown in Figure 3-1.

Step 4. When Power Supply PP-4834/PRR-15 is used, connect the applicable cable for 120 volt ac use or 24 volt dc use to the front power connector on the power supply and to the applicable power source.

Step 5. Fasten retainer to hold power supply in position.

Step 6. When Power Supply PP-4834/PRR-15 is used, set power supply PWR switch to the PWR (on) position, and check that PWR ON light on power supply is illuminated.

Note

If the PWR ON is not illuminated, check that the dimmer on light assembly is rotated to the open position.

c. ANTENNA INSTALLATION. - The receiver is designed to operate with either a whip antenna or a long wire antenna. Two whip antennas are supplied. One whip antenna is 30 inches long and the second whip antenna is 9 feet long. The 9 foot whip antenna will normally provide the best reception on bands 1 to 7 and the 30 inch whip should be used on bands 8 to 10. The long wire antennas (50 feet of wire) will

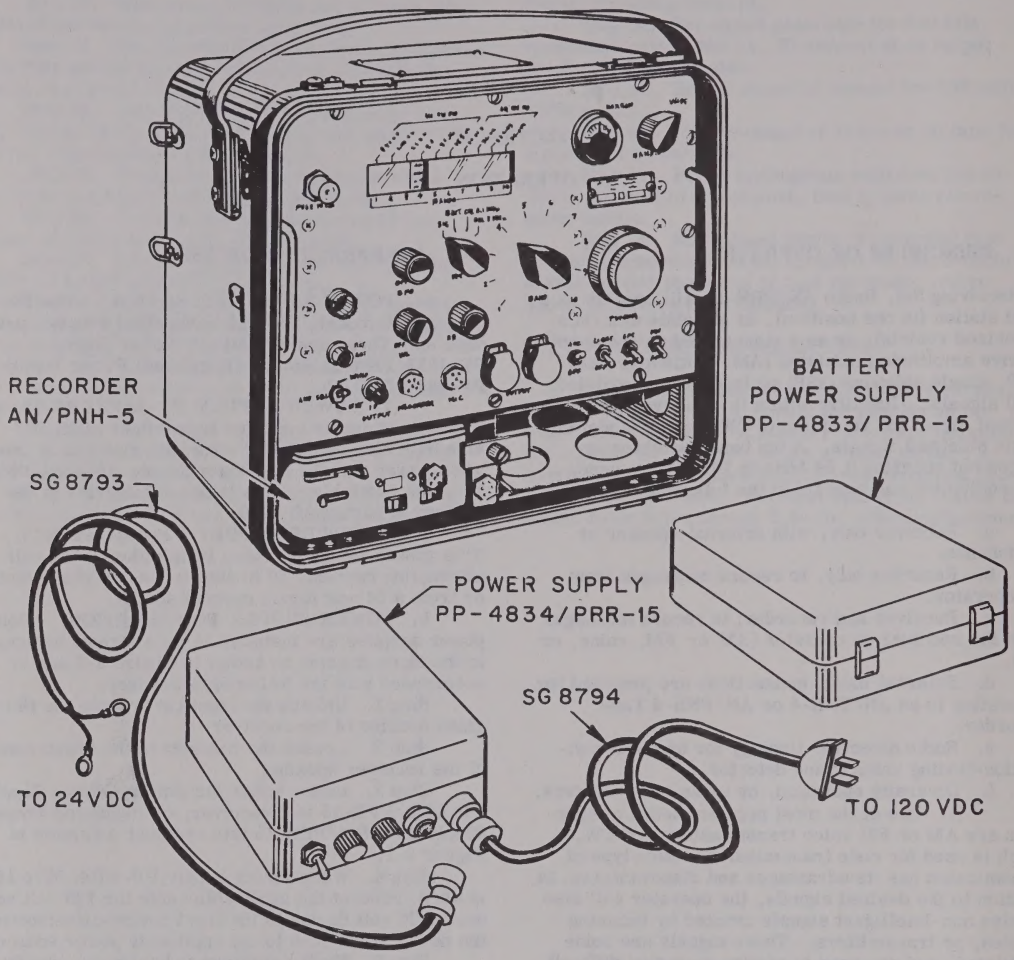


Figure 3-1. Receiver, Radio R-1484/PRR-15 with Power Supplies, PP-4833/PRR-15 or PP-4834/PRR-15

provide improved operation on bands 1 to 4 when operational facilities allow for its use.

(1) 30 INCH WHIP ANTENNA. - The 30 inch whip antenna is attached to the whip antenna input of the receiver through a right angle coaxial connector as shown in Figure 3-2A. The connector provides the required support to maintain the antenna in the upright position.

(2) NINE FOOT WHIP. - The nine foot whip antenna may be mounted in the same manner as the 30 inch whip antenna but is normally mounted on the support bracket located on the case cover of either the receiver case or accessory case as shown in Figure 3-2B. The 15 foot length of wire SG9349 is attached between the whip antenna terminal on the receiver and the antenna. At the receiver, the connection is made through the binding post adapter. At the antenna, the end of the wire with the lug attached to it is placed between the antenna support bracket and the antenna. The antenna is then screwed into the bracket, thus completing the electrical connection.

(3) LONG WIRE ANTENNA. - The long wire antenna (50 foot length of insulated wire) is attached to the EXT antenna connector through a binding post adapter as shown in Figure 3-2C. The wire should be placed as high as possible and clear of all metalic objects if possible. The end not connected to the receiver may be attached to a tree or other support which will keep it as high as possible.

d. RECORDER-REPRODUCER SET, SOUND AN/PNH-5 INSTALLATION. - The tape recorder is stored in the lower left section of the receiver housing and is held in place by the same retainer which

Figure 3-2A. Receiver, Radio R-1484/PRR-15 Antenna Installation, 30 Inch Whip

holds the power supply. The receiver recorder cable SG8790 is connected between the recorder connector of the receiver and the microphone connector on the tape recorder. The tape recorder normally operates from the set of batteries housed in the tape recorder. These batteries are listed in the servicing manual for the tape recorder.

(1) Under certain conditions as when the tape recorder batteries are depleted, it may be necessary to operate the tape recorder from the receiver power source. This can be accomplished through the connector at the lower center of the receiver housing and using the recorder power cable SG8791. To install the recorder power cable see Figure 3-3 and perform the following procedure:

Step 1. Remove the battery compartment cover on the tape recorder and store in a pocket on the front cover of the accessory case.

Step 2. Remove the dead batteries from the tape recorder and discard or store in pocket of the accessory case until they can be discarded.

Step 3. Insert the special adapter, at the end of the recorder power cable into the tape recorder battery compartment and fasten retaining screw.

Step 4. Connect the other end of the recorder power cable to the connector located adjacent to the recorder storage area in the receiver housing.

Note

The recorder will now operate from the receiver power supply. The function of the operating controls on the recorder are described in Table 3-1. A general operating procedure for the tape recorder is described in paragraph 3-5. Detailed recorder operation will be found in the tape recorder service manual.

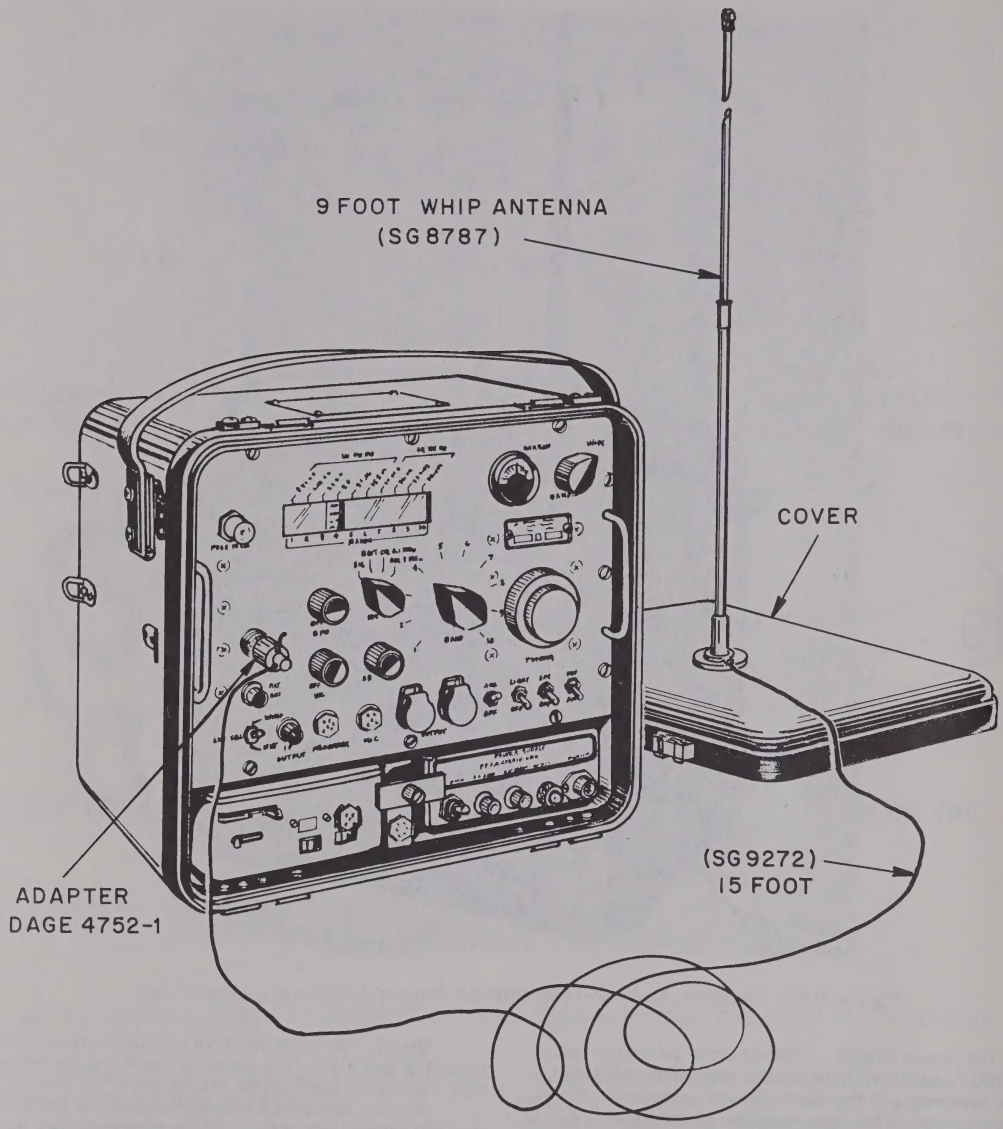


Figure 3-2B. Receiver, Radio R-1484/PRR-15 Antenna Installation, 9-Foot Whip

3-3. OPERATIONAL PROCEDURES.

a. DESCRIPTION OF CONTROLS. - The operating controls and indicators for the Radio Receiver R-1484/PRR-15, (Regulated) Power Supply PP-4834/PRR-15, and the associated AN/PNH-5 Tape Recorder are listed in Table 3-1, and shown in Figures 3-4, 3-5, and 3-6 respectively.

b. SEQUENCE OF OPERATION.

(1) BEFORE USE. - Prior to using the equipment for normal operation, perform the following procedure:

Step 1. Install the required power supply and antenna in accordance with procedures in paragraph 3-2b and 3-2c respectively.

Step 2. If the tape recorder is to be used, install in accordance with paragraph 3-2d and connect microphone to MIC connector.

Step 3. Connect headset to one of the OUTPUT connectors.

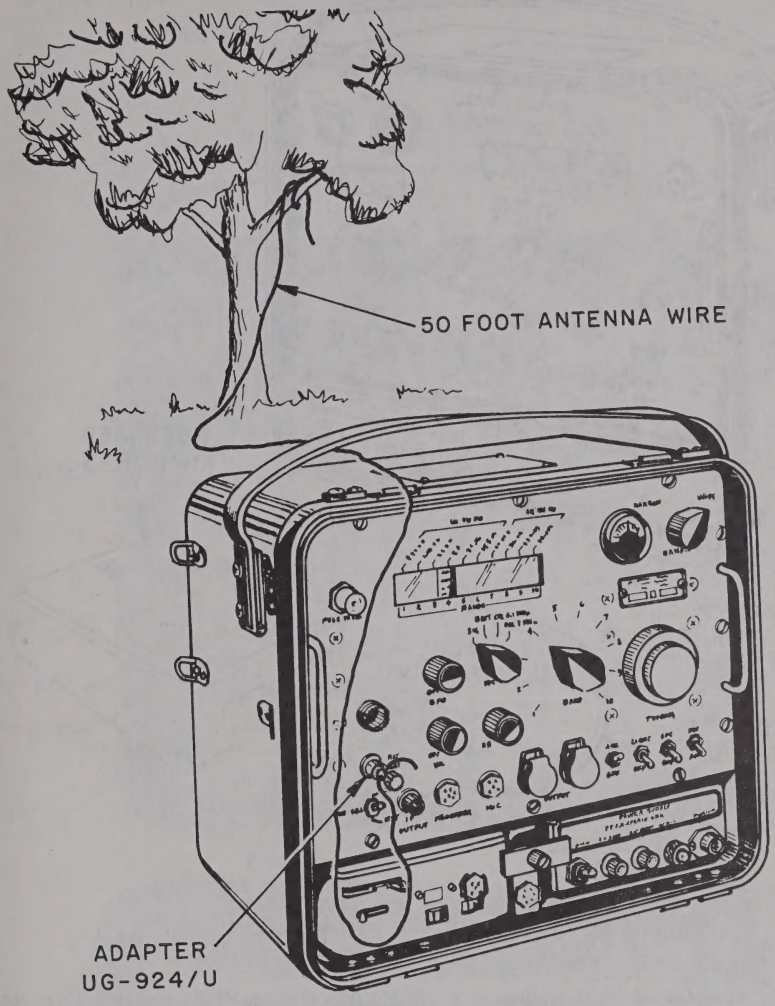


Figure 3-2C. Receiver, Radio R-1484/PRR-15 Antenna Installation, 50-Foot Wire

Step 4. Set all controls to the preliminary control position indicated in the last column of Table 3-1.

Step 5. If Regulated Power Supply PP-4834/-PRR-15, is used, set PWR switch to the PWR (on) position and check that pilot lamp on power supply is illuminated.

Step 6. Set VOL control to midrange and METER switch to BATT, then observe meter for an indication in the green area indicating proper voltage level from the power supply.

(2) DURING USE. - Operation of the receiver is described in the following subparagraphs for reception of various types of signals. When it is desired to use the tape recorder to record received signals or operator's comments, or for playback of recorded information, see paragraph 3-5. The procedure for calibrating the dial indicator is provided in paragraph 3-4. Use of a direction finder with the receiver will be found in the technical manual associated with the direction finder. If it is required to illuminate the dial at any time, place the LIGHT-OFF switch in the LIGHT-position.

(a) AMPLITUDE MODULATION RECEPTION. - The following procedure outlines operation of the receiver for reception of AM broadcasts.

Step 1. Set ANT SEL to the position corresponding to the type of antenna used.

Step 2. Set METER switch to SIG.

Step 3. Check that the AGC-OFF switch is set to AGC, the FM-AM switch is in the AM position, and the AFC-OFF switch is in the OFF position.

Step 4. Set BAND switch to desired band.

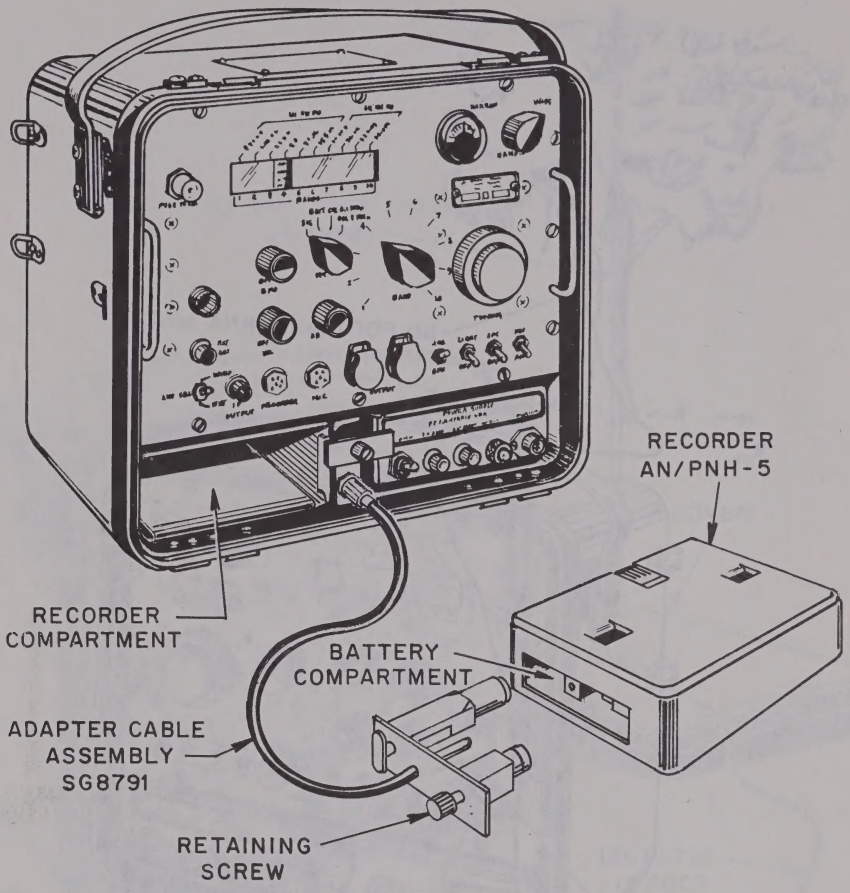


Figure 3-3. Tape Recorder Power Cable Installation

Step 5. For reception of standard broadcast stations or shortwave, set BANDWIDTH switch to WIDE. For reception of CW or SSB signals set BANDWIDTH switch to NARROW.

Note

The NARROW position on band 1 through 6 provides a passband of 6 kHz and on bands 7 through 10, 40 kHz. The WIDE position on bands 1 through 6 provides a passband of 10 kHz, and on bands 7 through 10, 120 kHz.

Step 6. Set the VOL control to midrange.

Step 7. Adjust the TUNING control for the desired frequency as indicated on the dial tape.

Step 8. Readjust VOL control for desired signal level at headset.

(b) FREQUENCY MODULATION (FM) RECEPTION. - The following procedure outlines operation of the receiver for reception of FM signals.

Note

FM is used only on bands 7 through 10.

Step 1. Set ANT SEL to the position corresponding to the type of antenna used.

Step 2. Check that the AGC-OFF switch is in the AGC position, the FM-AM switch is in the FM position and the AFC-OFF switch is in the OFF position.

Step 3. Set the BAND switch to the desired band, 7 through 10.

Step 4. Set BANDWIDTH switch to WIDE.

Step 5. Set VOL control to midrange.

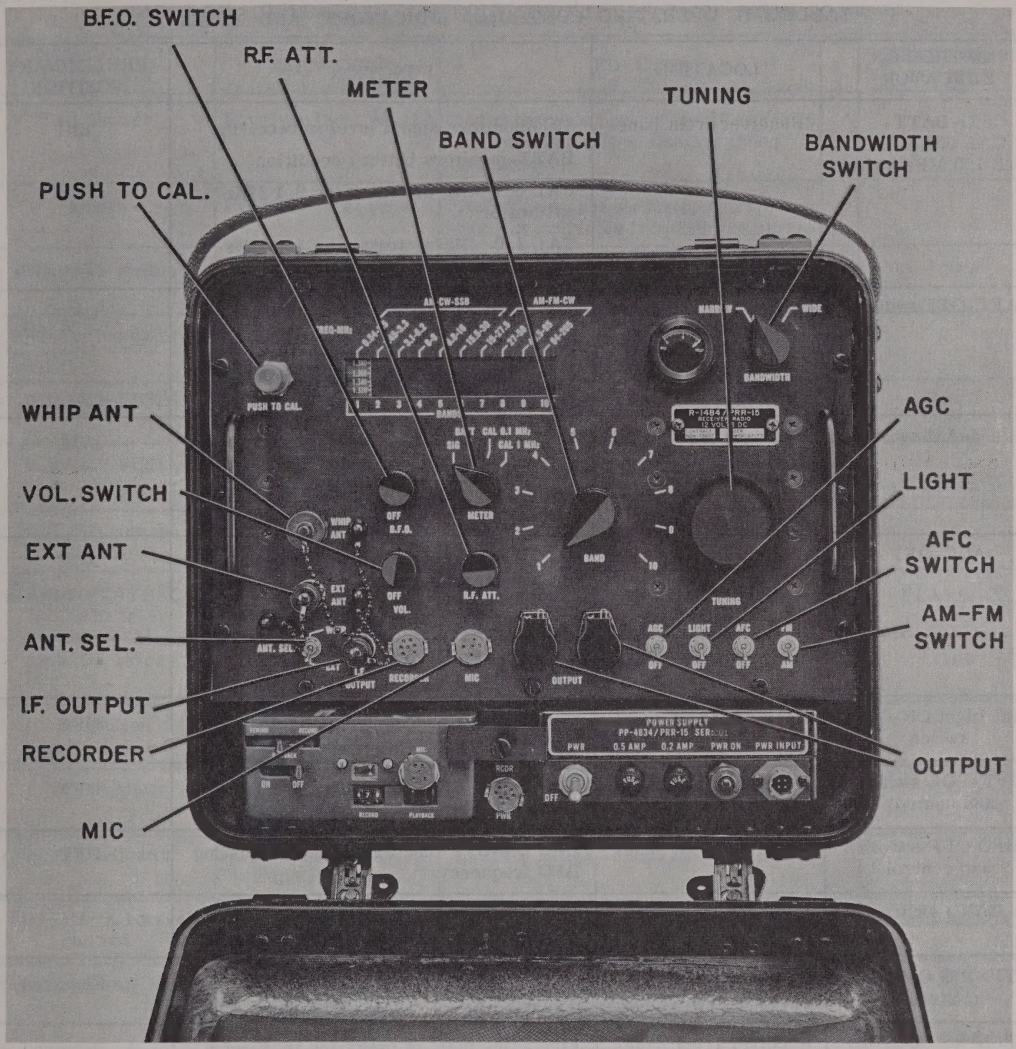


Figure 3-4. Receiver, Radio R-1484/PRR-15 Showing Operating Controls

Step 6. Adjust the TUNING control as required to locate the desired station and observe meter for maximum indication.

Step 7. When meter indicates maximum signal strength on the station, place AFC-OFF switch to AFC to lock on to the station.

Step 8. Readjust VOL control for desired signal level at headset.

(c) CONTINUOUS WAVE (CW) CODE RECEPTION. - The following procedure outlines operation of the receiver for reception of CW code signals.

Step 1. Set ANT SEL to position corresponding to the type of antenna used.

Step 2. Check that the AGC-OFF switch is in the AGC position, the FM-AM switch is in the AM position and the AFC-OFF switch is in the OFF position.

Step 3. Set the BAND switch to the desired band.

Step 4. Set the BANDWIDTH switch to NARROW.

Step 5. Set the VOL control to midrange and the BFO control to midrange.

Step 6. Adjust the TUNING control for the desired frequency.

Step 7. Readjust VOL control to desired signal level at headset.

Step 8. Readjust BFO control to obtain desired output tone or pitch.

TABLE 3-1. OPERATING CONTROLS, INDICATORS, AND FUSES

CONTROL OR INDICATOR	LOCATION	FUNCTION	PRELIMINARY POSITION
SIG-BATT-CAL 0.1 MHz-CAL 1.0 MHz switch	Receiver front panel	SIG-monitors signal level in receiver. BATT-monitors battery condition. CAL 0.1 MHz-activates the 0.1 MHz calibrator. CAL 1.0 MHz-activates the 1.0 MHz calibrator.	SIG
AFC-OFF switch	Receiver front panel	Two position switch used to activate the automatic frequency control circuit in the AFC position on bands 7 through 10 only. On bands 1 through 6 this switch has no effect.	OFF
FM-AM switch	Receiver front panel	FM - activates the frequency modulation detector circuitry on bands 7 through 10. AM - activates the amplitude modulation detector circuitry on all 10 bands.	AM
AGC-OFF	Receiver front panel	AGC - activates the automatic gain control circuits. OFF - Connects the RF ATT. control to allow manual gain control of the receiver. This position used primarily for direction finder operation.	AGC
Dial Light ON-OFF switch	Receiver front panel	Switch activates tuning dial light.	OFF
OFF-VOL switch and control	Receiver front panel	Receiver ON-OFF function, also for adjusting level of audio output.	OFF
BFO OFF switch and control	Receiver front panel	BFO ON-OFF function also for adjusting BFO frequency.	OFF
BAND switch	Receiver front panel	Ten-position rotary switch selects one of ten frequency bands for reception.	1
TUNING Control (coarse)	Receiver front panel	Coarse adjustment of operating frequency.	As Required
TUNING Control (fine)	Receiver front panel	Fine adjustment of operating frequency.	As Required
RF ATT Control	Receiver front panel	For controlling RF gain in strong signal areas. Or when using direction finding equipment.	Mid Range
ANT SEL WHIP-EXT. switch	Receiver front panel	Selects External antenna connection in EXT position or Whip antenna in WHIP position.	WHIP
BANDWIDTH	Receiver front panel	Two-position for selecting WIDE or NARROW bandwidth.	NARROW
PUSH TO CAL	Receiver front panel	Locks dial indication when calibrating the receiver.	- - -

TABLE 3-1. OPERATING CONTROLS, INDICATORS, AND FUSES (CONT'D)

CONTROL OR INDICATOR	LOCATION	FUNCTION	PRELIMINARY POSITION
Dial Shutter	Receiver front panel	Indicates which one of the 10 bands is in operation. Also displays tuned frequency.	- - -
Meter	Receiver front panel	Indicates signal strength, battery condition, or activates frequency calibrator.	- - -
PWR-OFF switch	Power Supply PP-4834/PRR-15	Activate Power Supply in PWR (up) position.	OFF
PWR ON indicator	Power Supply PP-4834/PRR-15	Illuminated when Power Supply has been activated.	- - -
0.2 AMP FUSE	Power Supply PP-4834/PRR-15	Protects input current of power supply.	- - -
0.5 AMP FUSE	Power Supply PP-4834/PRR-15	Protects output current of power supply.	- - -
RECORD rotary control	On end of Tape Recorder	Used for adjusting record signal level.	6
REWIND-PLAYBACK-RECORD lever	On end of Tape Recorder	Selects the mode of operation.	PLAYBACK
OFF-ON lever	On end of Tape Recorder	Turns the tape recorder power ON and OFF.	OFF
"A" Button	On end of Tape Recorder	Connects the battery indicator across the amplifier battery of tape recorder.	- - -
"M" Button	On end of Tape Recorder	Connects the battery indicator across the motor battery.	- - -
Battery Indicator	On end of Tape Recorder	Indicate battery condition.	- - -
PLAYBACK rotary control	On end of Tape Recorder	Used for adjusting playback audio level.	MID RANGE
Tape Monitor Window	On lid of Tape Recorder	Provides visual indication of tape movement and shows amount of tape left on the supply reel.	- - -
IF OUTPUT connector	Receiver front panel	Output for direction finding equipment.	- - -
WHIP ANT (coaxial) connector	Receiver front panel	Provides electrical contact with the WHIP antenna (high impedance Input).	- - -
EXT ANT (coaxial) connector	Receiver front panel	Provides electrical contact with the EXT antenna. This is a low impedance input.	- - -
Accessory Power Connector	Between Tape Recorder and Battery Box on receiver case	Connects receiver battery pack with tape recorder.	- - -
MIC Connector	Receiver front panel	Five-pin locking connector for connecting the microphone to the receiver.	- - -

TABLE 3-1. OPERATING CONTROLS, INDICATORS, AND FUSES (CONT'D)

CONTROL OR INDICATOR	LOCATION	FUNCTION	PRELIMINARY POSITION
RECORDER Connector	Receiver front panel	Seven-pin locking connector provides electrical connection from the receiver output to the tape recorder.	- - -
OUTPUT Phone jacks (2) PL55 Connectors	Receiver front panel	Output for monitoring receiver, or electrical connecting for dual or diversity operation.	- - -
Battery Pack Connector	Inside Bottom of Receiver Case	Nine-pin connector provides electrical connections between battery pack and receiver.	- - -
INPUT Connector	Power Supply PP-4834/PRR-15	Connects power supply to 120 VAC 50 to 400 Hz single phase source or 24 VDC source.	- - -
MIC connector (5-pin locking)	On end of Tape Recorder	For connecting the output of the receiver or microphone to the tape recorder.	- - -

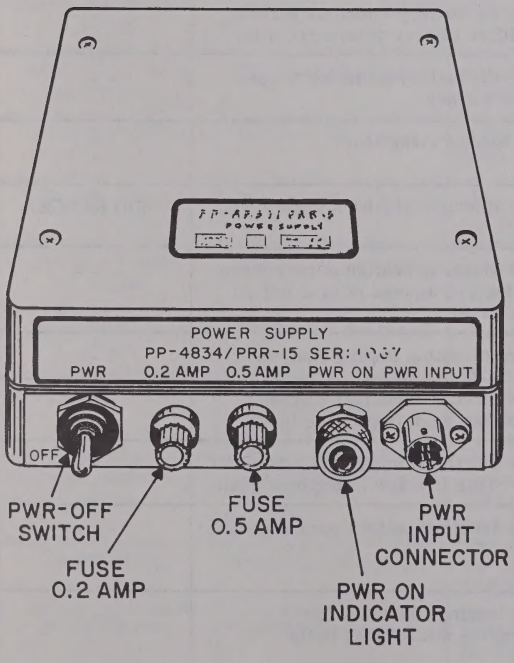


Figure 3-5. Power Supply, PP-4834/PRR-15 showing Controls, Indicators and Fuses

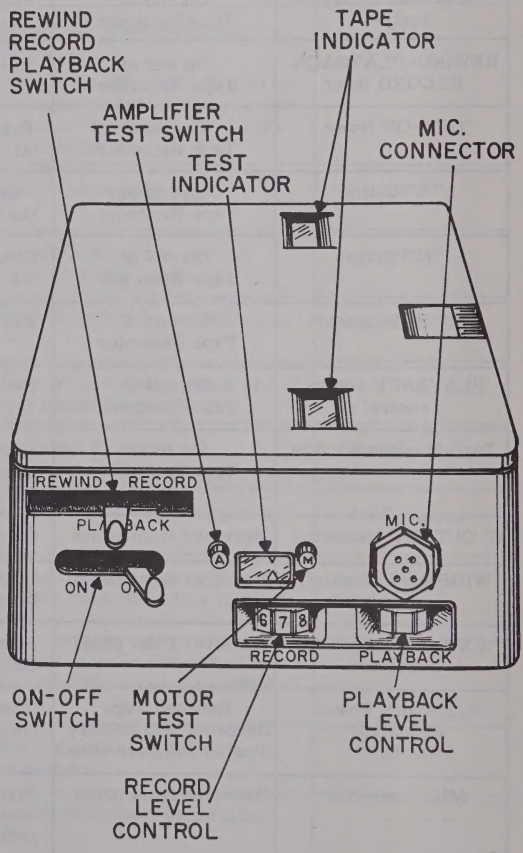


Figure 3-6. Tape Recorder, AN/PNH-5 showing Controls and Indicators

Note

Adjustment of the BFO control only changes pitch of received signal and does not effect tuning of the receiver.

(d) SINGLE SIDEBAND (SSB) RECEPTION. - The following procedure outlines a method for reception of SSB signals. These signals will probably be limited to the range from bands 2 to 6.

Step 1. Set ANT SEL to position corresponding to the type of antenna used.

Step 2. Check that the AGC-OFF switch is in the AGC position, the FM-AM switch is in the AM position and the AFC-OFF switch is in the OFF position.

Step 3. Set the BAND switch to the desired band.

Step 4. Set the BANDWIDTH switch to NARROW.

Step 5. Set the VOL control to midrange.

Step 6. If the desired signal is known to be an upper side band, turn the BFO control to the minimum ON position. If the signal is a lower side band, set BFO control to maximum position. If sideband is not known, set BFO control to midrange.

Step 7. Adjust TUNING control to desired frequency as indicated on the dial.

Step 8. Readjust BFO control for maximum clarity of the received signal.

Step 9. Readjust VOL control for desired output signal level to headset.

(3) AFTER USE. - When required operation of the AN/PRR-15 is terminated, place VOL control completely counterclockwise to OFF position. If Power Supply PP-4833/PRR-15 is used, place PWR-OFF switch in OFF position. If Tape Recorder AN/-PNH-5 is used place ON-OFF switch in OFF position and REWIND- PLAYBACK-RECORD lever in PLAYBACK position.

Note

The operator may return all control to the preliminary position listed in Table 3-1 if equipment is to be left off for any extensive period of time.

(4) SECURE. - Disconnect all cables, earphones, microphones, recorder, power supply, and antennas. Store all components in the accessory case. Small items such as adapters may be stored in the pockets in the cover of either the receiver housing or accessory case. Place covers on cases and secure with attached latches. Equipment may then be attached to packboard for carrying or may be hand carried by the attached web straps. If equipment is not to be used for several days, remove batteries from Power Supply PP-4833/PRR-15.

3-4. CALIBRATION OF RECEIVER.

The receiver is provided with two built-in frequency calibrators. One operates at 0.1 Megahertz and the second operates at 1.0 Megahertz, allowing the operator a means of checking the dial indication against the actual tuned frequency of the electronic circuits. The 1.0 Megahertz calibrator may be used on all ten bands. The 0.1 Megahertz calibrator will normally be used only on bands 1 through 7. On bands 5 through 7, it will normally be found advantageous to calibrate first to the nearest 1.0 Megahertz interval, then locate the 0.1 Megahertz points. Use the following procedure for dial calibration.

Step 1. Set METER switch to CAL 0.1 MHz or CAL 1.0 MHz as desired for the band in use.

Step 2. Set VOL control and BFO control to midrange.

Step 3. Check that AGC-OFF switch is in the AGC position, FM-AM switch is in the AM position and AFC-OFF switch is in the OFF position.

Step 4. Set BAND switch to desired band.

Step 5. To ensure accurate calibration turn the outer TUNING control 10 full turns clockwise. This will ensure that the tuning capacitors are set for highest frequency on the band in use.

Step 6. Observe the frequency indication on the dial tape to be sure dial tape is at the "stop line". If dial tape is not at the "stop line", press and hold PUSH TO CAL button and rotate TUNING control two turns counterclockwise. Release PUSH TO CAL button and rotate TUNING control clockwise three full turns. Repeat if necessary until "stop line" appears at hairline in dial window.

Step 7. Rotate TUNING control until hairline is lined up with the closest 0.1 MHz or 1.0 MHz multiple of the desired frequency depending on which calibrator signal is in use.

Note

As the frequency indicator approaches a multiple of 0.1 MHz or 1.0 MHz, an audio tone should be heard. As the dial tape passes through the 0.1 MHz or 1.0 MHz multiple the audio tone should pass from a high pitch sound through a no sound (zero beat) condition and if the TUNING control is rotated further the pitch of the audio should again increase. The "zero beat" is the electrical "on frequency" indication and should correspond to mechanical "on frequency" indication which is the point on the dial where the hairline on the dial window intersects the required multiple of 0.1 MHz or 1.0 MHz. If the electrical and mechanical checkpoints are not in agreement proceed with Step 8.

Step 8. Rotate TUNING CONTROL to align the dial window hairline with the desired frequency checkpoint. Press and firmly hold the PUSH TO CAL button with the left hand then slowly rotate TUNING control back and forth with the right hand until the "zero beat" condition is obtained. When the "zero beat" is obtained, release the PUSH TO CAL button. The frequency indicated in the dial window should now be the same as the frequency of the electronic circuits.

CAUTION

When holding the PUSH TO CALL button it is possible to turn the TUNING control far off frequency. Be sure that the tuning control is rotated only a small amount each way initially. If no tone is heard at all, it indicates you are still at least several kHz off frequency. Increase the amount of rotation of the TUNING control until the audio tone is heard, then slowly continue to rotate the TUNING control to obtain the "zero beat"

Step 9. If the first calibration point is at a multiple of 1.0 MHz, on bands 1 to 5, additional checks can be made at the 0.1 MHz interval to ensure precise frequency readings.

3-5. RECORDER-REPRODUCER SET, SOUND AN/PNH-5 OPERATION.

a. LOADING THE MAGAZINE. - Remove a tape magazine from the accessory case. Move the OFF-ON switch to OFF and the REWIND-PLAY-BACK-RECORD lever to PLAYBACK. Remove the cover by lifting the cover latch. The same motion that lifts the latch will lift the cover. Insert the tape magazine with side labeled A face upward. Rotate the hub of the left-hand reel counterclockwise and the hub of the right-hand reel clockwise until all tape slack has been removed. This procedure will ensure that the tape will enter the tape slot when the magazine is inserted in the recorder. Insert the thumb and index finger in the two cutouts located near the central section of the magazine. Align the edge of the magazine so that the edge of the tape will thread into the tape slot. Then lower the magazine over the four corner guide pins. When the tape magazine is in place in the compartment, check the tape, it must be tight and properly located in the recording channel. Replace the cover, the recorder is now ready for operation. Side A and Side B will each provide 30 minutes of recording time.

(1) To test the recorder batteries, move the ON-OFF switch to ON and depress button"A"to check the amplifier battery, and depress button "M" to check the motor battery. The motor indicator works only when the motor is activated. The white shade in the battery indicator must move beyond the pointers to indicate a good battery.

b. RECORDING. - Set the RECORD level control on the tape recorder between 4 and 6 for a standard recording. Set the REWIND-PLAYBACK-RECORD lever to RECORD and the ON-OFF lever to ON. Recording will commence immediately when the recorder is turned on. Hold the microphone about three inches away from the mouth, and depress the

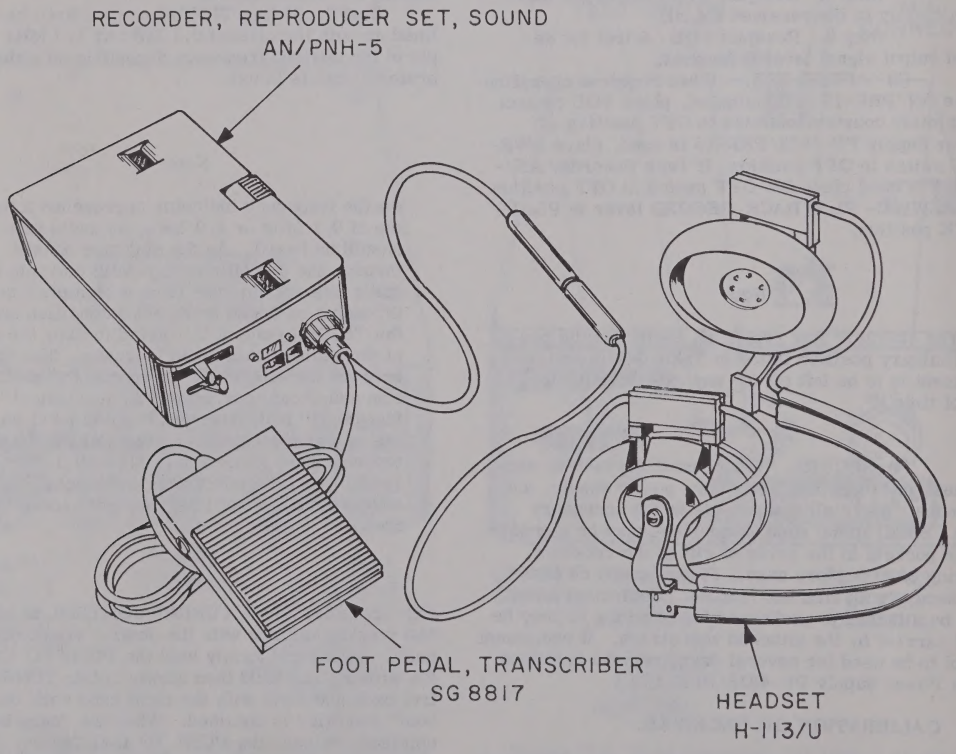


Figure 3-7. Tape Recorder in Playback Position

microphone button. It is advisable to make a test recording to check for proper control settings before proceeding with regular recording. To record from the receiver, simply release the push-to-talk button and the recorder will be automatically transferred to the receiver output. To reverse the magazine, remove the cover as described in subparagraph a. preceding. Using the thumb and index finger, grasp the magazine by the finger cutouts and lift it out of the recorder. Turn the magazine over and reinstall it as outlined under LOADING.

(1) Tape movement may be observed thruogh the tape window in the cover. The reference marks on the side of the window may be used as a reference when recording or rewinding. These marks are calibrated in approximate play or record time remaining. The receiver output may be monitored during recording by plugging the headset into one of the output jacks on the receiver. When the record session is completed, move the REWIND-PLAYBACK-RECORD lever to PLAYBACK and the ON-OFF lever to OFF.

CAUTION

Always move the function selector back to PLAYBACK after each operation to prevent an accidental erasure.

c. PLAYBACK OPERATION. - Playback operation may be performed in two ways. When playback is desired during normal operation, the information can be played back through the microphone as described in paragraph (1) below. When playback is desired for purposes of transcirbing information, use the procedure described in paragraph (2) below.

(1) When the microphone is connected to the receiver it can be used for inserting operator comments onto the tape as described in paragraph b. above, or may be used to playback information recorded on the tape. To playback information, rewind tape as described in paragraph d below, then set the REWIND-PLAYBACK-RECORD lever to PLAYBACK and press the button on the microphone. Hold the microphone against the ear. The information will be played back as long as the microphone button is held.

(2) When it is desired to playback information for the purpose of transcribing, set the REWIND-PLAYBACK-RECORD lever to the PLAYBACK position and the ON-OFF lever is set to OFF. Connect equipment as shown in Figure 3-7. If the desired side of tape is not facing upward, turn the magazine over as described previously. When the magazine is installed and properly seated and the cover set in place, move the ON-OFF lever to ON. Depress foot pedal and adjust the PLAYBACK volume control for a comfortable listening level. When the tape has reached the end of the reel, tape movement will stop automatically. When playback operation is completed, the OFF-ON lever should be moved to the OFF position to conserve the batteries.

d. REWIND OPERATION. - Move the ON-OFF switch to the ON position and hold the REWIND-PLAYBACK-RECORD lever in the REWIND position. Allow the tape to rewind to the desired point. The REWIND-PLAYBACK-RECORD lever is equipped with an automatic spring return. When the holding pressure is removed, the REWIND-PLAYBACK-RECORD lever will automatically move toward the PLAYBACK position. If the ON-OFF lever is in the ON position, do not let the REWIND-PLAYBACK-RECORD lever snap back to the PLAYBACK position as the tape will spill. Manually move the lever back to the PLAYBACK position. The tape is then ready for playback.

3-6. DUAL SYSTEM OPERATION.

To provide dual system operation, two receivers are operated in parallel. Simultaneous monitoring and recording of signals at two different frequencies is possible, or of the combined output at one frequency (diversity reception). Diversity reception is used to reduce the effects of fading, which is prevalent at certain frequencies. In this mode of operation, several installed antennas, each connected to its own receiver, are spaced several wave lengths apart from one another. The demodulated outputs of the receivers are combined to produce one output that can be monitored and/or recorded. To operate in this mode, insert one plug of the patch cord into a OUTPUT connector on one receiver, and insert the plug at the other end of the cable into a OUTPUT connector on the other receiver. Insert headset connector into remaining OUTPUT connector on either receiver. Only one recorder is used if a recording is to be made. For dual system operation, follow the same procedures except for the tuning, tune each receiver as required.

3-7. AN/TNH-4 OR AN/PNH-4 RECORDER OPERATION.

Refer to the applicable technical manual for proper operation of these recorders.

3-8. DIRECTION FINDING OPERATION.

Refer to applicable technical manual for proper operation and use of the direction-finding equipment. Operation of the receiver is the same as for normal operation except the AGC-OFF control is set to OFF and the RF ATT is used to manually set the gain level and the direction finder is connected to the IF OUTPUT connector on the receiver front panel.

3-9. BATTERY INSTALLATION.

a. BATTERY POWER SUPPLY PP-4833/PRR-15. - The battery power supply operates with either nine "C" size batteries or eight "D" size batteries. To install or replace batteries use the following procedure and refer to Figure 3-8.

Step 1. Remove Battery Power Supply PP-4833/PRR-15 from receiver housing by loosening the power supply retainer on the receiver housing, then pulling the power supply straight forward.

Step 2. Unlatch the four retaining clips, Figure 3-8, Item 1, then position battery power supply with connector, Item 2, away from installer.

Step 3. Remove the top of battery housing, Item 3, from battery housing, Item 4.

Step 4. Remove old batteries if present and install either "D" size batteries as shown in Figure 3-8A, or "C" size batteries as shown in Figure 3-8B.

Note

Be sure all batteries are positioned in the indicated direction or equipment will not operate. The "C" size batteries should be placed in the holders, Item 5, before inserting in to power supply.

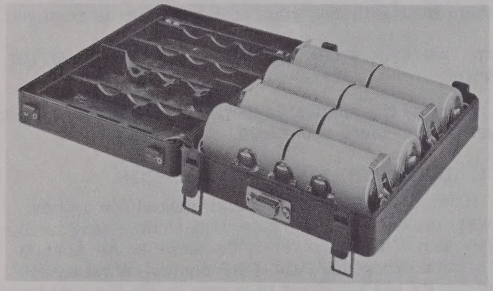
WARNING

DO NOT DISCARD OLD BATTERIES IN AN INCINERATOR OR OTHER SOURCE OF HIGH TEMPERATURE. HIGH TEMPERATURES MAY CAUSE BATTERIES TO EXPLODE.

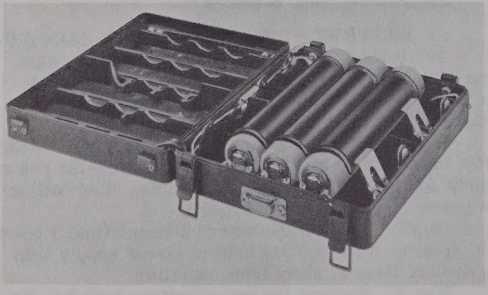
Step 5. Place top cover, Item 3, on battery housing, Item 4, taking care not to damage rubber gasket along outer edge of battery housing.

Step 6. Reattach retaining clips, Item 1, to hold cover, Item 3, and battery housing, Item 4, together.

Step 7. Insert battery power supply into lower right section of receiver housing being sure connector is towards the rear and the battery power supply cover is upwards. Press power supply into place so that the connector at the rear will properly mate.



"D" Size (8-Req'd)



"C" Size (9-Req'd)

Figure 3-8. Battery Power Supply, PP-4833/PRR-15, Battery Installation

Step 8. Tighten the power supply retainer on receiver to secure the power supply in place.

CAUTION

Do not leave dead batteries in the case as they will corrode and damage the battery terminals.

b. RECORDER REPRODUCER SET, SOUND AN/PNH-5. - To install or change batteries in the tape recorder perform the following procedure:

Step 1. Remove the end cover, Figure 3-9, by loosening the captive screw with a coin.

Step 2. Remove old batteries and insert two motor batteries and one amplifier battery as shown in Figure 3-9.

CAUTION

Batteries are marked with direction arrows. These arrows shall always point in. Thus, the negative (-) symbol on each battery will be toward the outside. Polarity reversal of the motor batteries will reverse the direction of the motor; reversing the amplifier battery polarity will damage capacitors in the amplifier circuit.

Step 3. Insert the lip of the end cover under the edge of the battery compartment opening, then press the end cover in place and tighten the retaining screw.

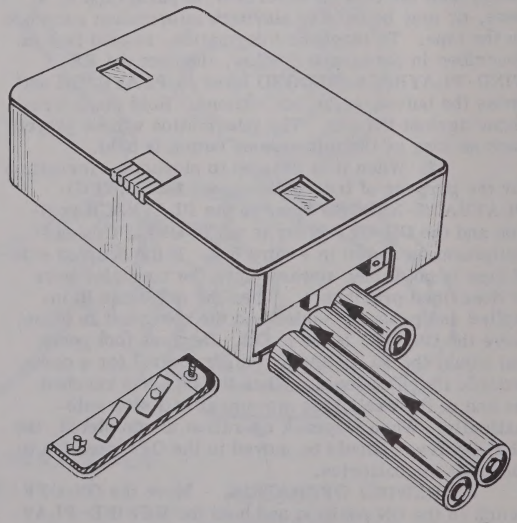


Figure 3-9. Recorder, Tape AN/PNH-5 Battery Installation

3-10. OPERATION UNDER UNUSUAL CONDITIONS.

a. GENERAL. - It may be difficult to operate the receiver in regions where extreme moisture, cold, heat, humidity, or sandy conditions prevail. In the following paragraphs, instructions are given for minimizing the effects of these unusual operating conditions.

b. OPERATION IN ARCTIC CLIMATES. - Subzero temperatures and climatic conditions associated with cold weather will affect the operation of the equipment. Instructions and precautions for operation are as follows:

(1) Handle the equipment carefully.

(2) Keep the equipment as warm and as dry as is possible.

(3) If the set is not in a heated enclosure, construct an insulated box with heaters if possible. Keep the heaters turned on during the operation period provided that it does not over-tax the source. If heaters are not available, use a light bulb to generate heat.

(4) Equipment that has been exposed to the cold will start to sweat when it is brought into a warm room. It will continue to do so until the equipment has reached room temperature; and when it does, dry it thoroughly. This condition also arises during the day when the equipment warms up after a nights exposure to the cold.

c. OPERATION IN TROPICAL CLIMATES. - When it is necessary to operate in tropical climates, special care is required in the placement of the equipment. Keep the receiver in an enclosure where the direct rays of the sun do not reach it. The unit may be installed in a tent, hut, or when necessary, in an underground dugout. Units installed below ground or in swampy areas are subject to a higher than normal amount of moisture. Ventilation is usually very poor and the humidity causes condensation of moisture on the equipment whenever the temperature of the equipment becomes lower than the ambient air temperature. To minimize this action, place a lighted electric bulb under the equipment.

d. OPERATION IN THE DESERT. - Conditions similar to those of tropical climates often prevail in desert areas. Use the same precautionary measures to ensure proper operation of the equipment.

(1) Sand, dust and dirt may enter into the dial drive and other moving parts if the receiver is not securely fastened to the housing. A preventive measure is to check that receiver is securely fastened and, when possible, to house the equipment in a dustproof shelter. If a building is not available, and the receiver is operated in a tent, secure the sidewalls of the tent with sand to prevent flapping and sand blowing.

3-11. OPERATOR MAINTENANCE.

a. INSPECTION AND CLEANING. - The following procedures are to be performed during the inspection period:

(1) Dust all surfaces with a clean cloth.

(2) Unfasten the front panel and blow out all dust and dirt on the chassis. Use low pressure if air gun is used.

(3) Visually inspect all electrical components for poor connections. Check for loose plug-in components and bent or broken pins on the connectors.

(4) Open the cover of the recorder and dust the tape compartment. Use a cotton swab moistened with alcohol and clean the record and erase heads. Rub the surface of the heads in a vertical direction until all oxide deposits are removed.

(5) Clean the tape cartridge with a damp cloth or sponge. For instructions on cleaning the interior of the cartridge and for cleaning and care of the tape, see the Service manual for the tape recorder.

(6) If the receiver is to be stored, remove all batteries from the receiver and tape recorder and store them separately.

b. FUSE REPLACEMENT. - Two fuses are used in Receiving Set, Radio AN/PRR-15. These are located on Power Supply PP-4834/PRR-15 as shown in Figure 3-5. Fuse F1 protects the input circuit of the power supply when operating on 120 volts ac. Failure of this fuse will still allow operation from a 24 volt dc source. Fuse F2 protects the regulator circuit from being overloaded. To replace either fuse, unscrew the fuse holder cap by turning counter clockwise, then pull the fuse out of the fuse holder. Insert a new fuse into the holder and screw cap back on fuse holder.

NOTE

Spare fuses will normally be stored in the pocket located in the cover of either the receiver housing or the accessory case.

CAUTION

Be sure to use only the correct fuse. Fuse F1 is a 0.2 ampere fuse and Fuse F2 is a 0.5 ampere fuse.

SECTION 4

TROUBLESHOOTING

4-1. GENERAL.

This section contains the theory of operation for Radio Receiving Set AN/PRR-15. Also included is general information on logical troubleshooting procedures which may aid the technician in localizing a faulty module.

a. The theory is provided first at a system block diagram level to show the interrelationship of the various modules within the receiving set. This description is then followed with a functional circuit breakdown. Each functional circuit is described at a block diagram level then at a detailed circuit level.

b. A thorough understanding of the interrelationship of the system blocks and of the effect of the various controls on the operation of the circuits is mandatory for localization of system faults to the various subassemblies.

c. All possible troubles that may arise when operating the equipment cannot be described in this manual. Maintenance personnel shall proceed to locate the defective component using the standard techniques of signal tracing and voltage and resistance checks.

Note

Before proceeding with any troubleshooting procedures, check front panel controls of the equipment to make certain incorrect settings are not causing faulty operation.

4-2. LOGICAL TROUBLESHOOTING.

a. SYMPTOM RECOGNITION. - This is the first step in the troubleshooting procedure and is based on a complete knowledge and understanding of equipment operating characteristics. All equipment troubles are not the direct result of component failure; therefore, a trouble in an equipment is not always easy to recognize since all conditions of less than peak performance are not always apparent. This type of equipment trouble is usually discovered while accomplishing preventive maintenance procedures. It is important that the "not so apparent" troubles, as well as the apparent troubles, be recognized.

b. SYMPTOM ELABORATION. - After an equipment trouble has been recognized, all the available aids designed into the equipment should be used to further elaborate on the original trouble symptom. Use of front panel controls and other built-in indicating or testing aids should provide better identification of the original trouble symptom.

c. LISTING PROBABLE FAULTY FUNCTION. - The next step in logical troubleshooting is to formulate a number of "logical choices" as to the cause and likely location of the trouble. The "logical choices" are mental decisions which are based on knowledge of the equipment operation, a full identification of the trouble symptom, and information contained in this manual. The overall functional description and its associated block diagram should be referred to when selecting possible faulty functional sections.

d. LOCALIZING THE FAULTY FUNCTION. - For the greatest efficiency in localizing trouble, the functional sections which have been selected by the "logical choice" method should be tested in the order that will require the least time. This requires a mental selection to determine which section to test first. The selection should be based on the validity of the "logical choice" and the difficulties in making the necessary tests. If the tests do not prove that functional section to be at fault, the next selection should be tested, and so on until the faulty functional section is located. As aids in this process, the manual contains block diagrams for the various functional section of the equipment. Also, test data (such as information on control settings, critical adjustments, and required test equipment) is supplied.

e. LOCALIZING TROUBLE TO THE CIRCUIT. - After the faulty functional section has been isolated, it is necessary to make additional "logical choices" as to which group of circuits or which circuit (within the functional section) is at fault. Block diagrams and schematic diagrams for the functional section and individual functional circuit groups (when required) provide the signal flow and test location information needed to bracket and then isolate the faulty circuit.

f. FAILURE ANALYSIS. - After the trouble (faulty part, misalignment, etc.) has been located (but prior to performing corrective action), the procedures followed up to this point should be reviewed to determine exactly why the fault affected the equipment in the manner that it did. This review is necessary to make certain that the fault discovered is actually the cause of the malfunction, and not just a result of the malfunction.

4-3. FUNCTIONAL OPERATION.

a. GENERAL. - A block diagram of the receiver is shown in Figure 4-1. The block diagram is arranged to show the functional relation of the various stages and the signal path through the re-

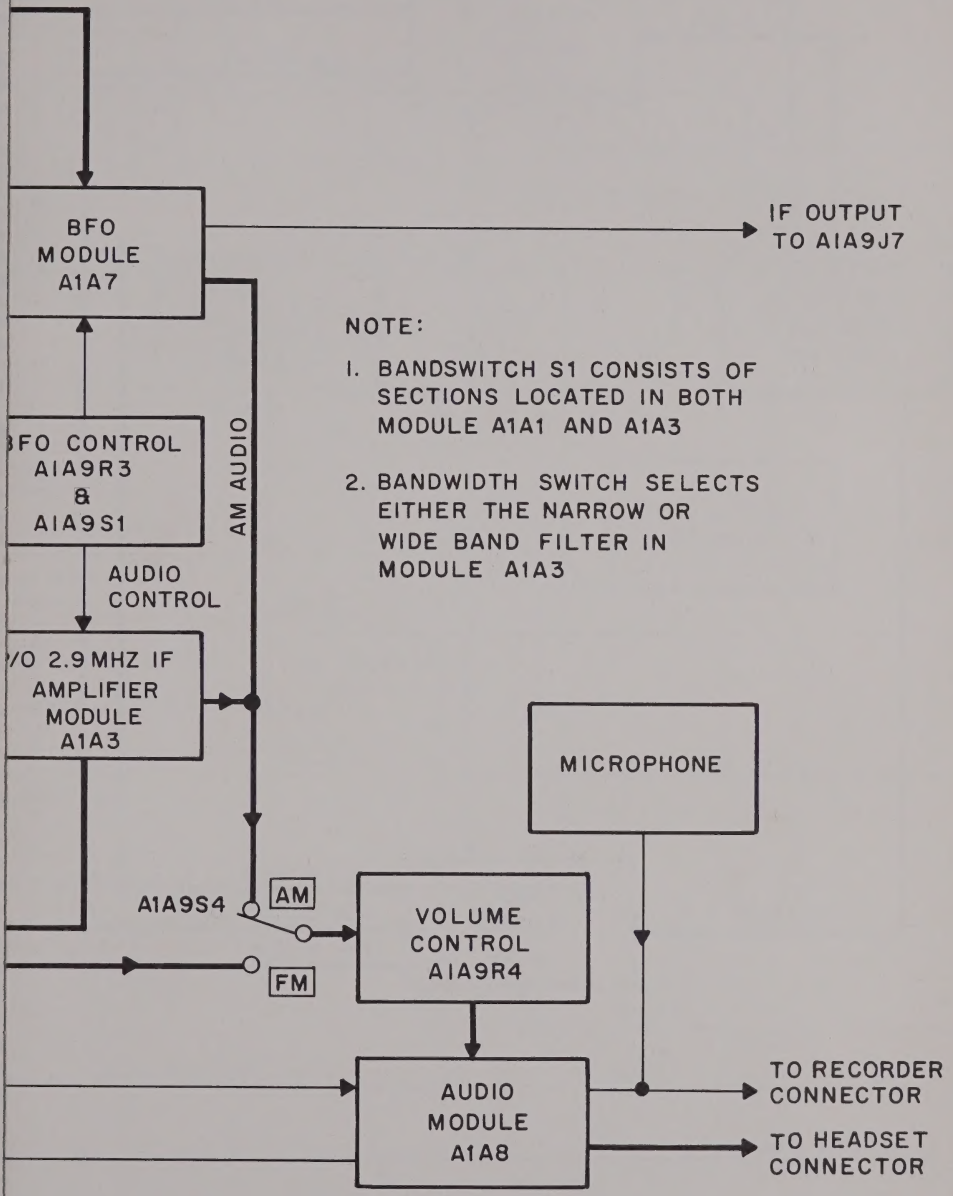


Figure 4-1. Receiver, Radio R-1484/PRR-15, Block Diagram

SECTION 4

TROUBLESHOOTING

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Before proceeding with any troubleshooting procedures, check front panel controls of the equipment to make certain incorrect settings are not causing faulty operation.

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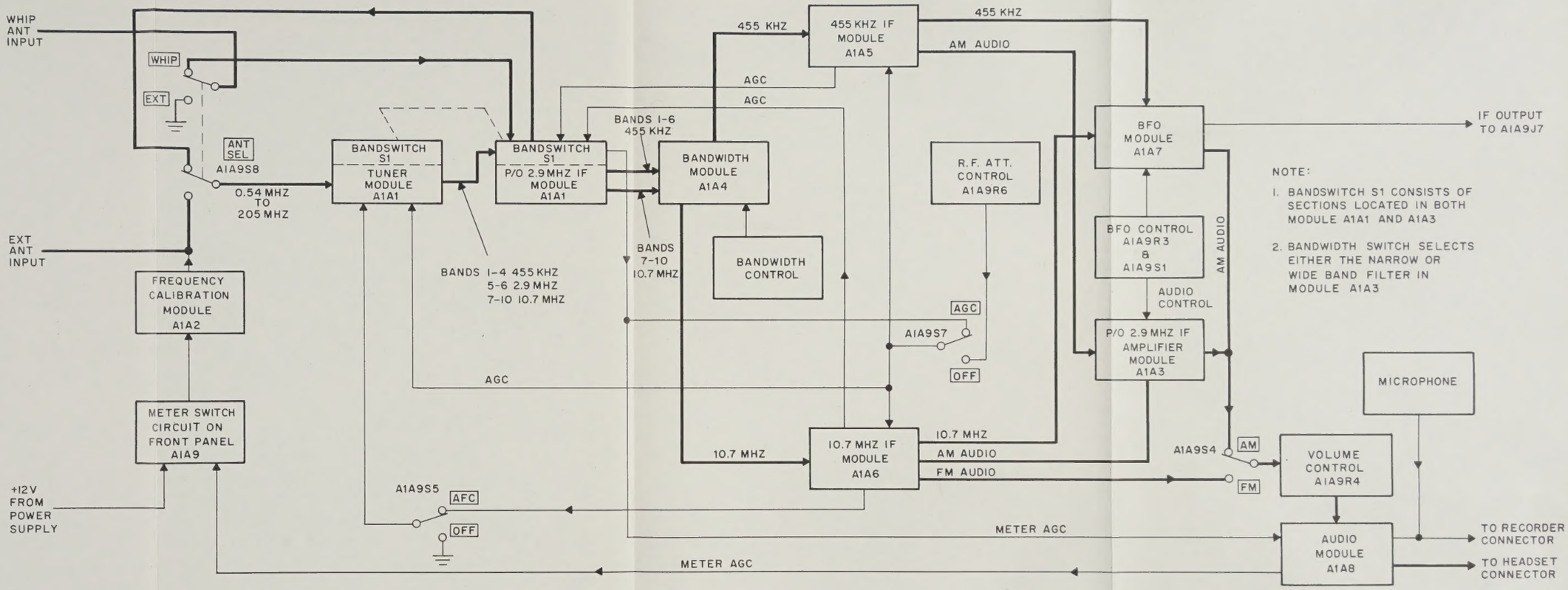

Figure 4-1. Receiver, Radio R-1484/PRR-15, Block Diagram

ceiver. A detailed description of circuit operation is also presented in this section.

(1) The purpose of the receiver is to pick up and monitor radio frequency signals, therefore the location of the receiver and the placement of the antenna is very important.

(2) Electromagnetic waves are not uniformly distributed throughout space and are affected by the adjacent terrain. In addition. the weather conditions and various peculiarities that are attributes of signal at different frequencies all affect the received signal. Three basic effects are caused by temperature, vegetation and terrain. These are: (1) reflection, (2) refraction, and (3) diffraction. To some radio frequencies the terrain and the upper atmosphere acts as a reflecting medium causing the signals to be reflected and producing a skip effect. As a result the signal is not uniformly distributed. When this reflecting medium moves, as is the case for the upper atmosphere (ionosphere), the signal may fade away or it may increase in strength. Diversity operation (see paragraph 3-6) may be used to improve reception under these conditions.

(3) Higher temperatures cause a certain amount of bend in signal waves at specific frequencies. These waves will then follow the curvature of the earth and are thus produced at a higher energy level. This will account for better reception on certain days. Bending or refraction does not affect all frequencies to the same extent. Diffraction is caused by vegetation and this phenomena might be called scattering. In effect the signal splits, which might result in either a gain or loss of signal.

b. INPUT RF SIGNAL. - The input to the receiver may be amplitude modulated (AM) over a frequency range of 0.54 Megahertz to 205 Megahertz or frequency modulated (FM) over a frequency range of 15 Megahertz to 205 Megahertz. The mode of reception for amplitude modulated operation is type A1, A2, or A3 transmission and for frequency modulated operation is type F3 transmission. The input RF energy is picked up by either a whip or external antenna and the ANT SEL switch is set to select the desired antenna input. Radio frequency energy picked up by the external antenna is routed directly to the tuner module. Radio frequency energy picked up by the whip antenna is routed through a section of the BAND switch on the 2.9 Megahertz IF amplifier module then to the tuner module. The BAND switch changes the WHIP antenna input from a high impedance input for bands 1 through 6 to a 50 ohm impedance for bands 7 through 10.

c. TUNER MODULE. - The front panel BAND switch provides for selection of any one of 10 bands. The output signal from the tuner is then coupled to the 2.9 Megahertz intermediate frequency amplifier. The tuner also receives an automatic gain control (AGC) voltage which automatically sets the overall receiver gain, an automatic frequency control voltage (during frequency-modulated operations on bands 7 through 10) which automatically corrects the local oscillator to assure a 10.7 Megahertz IF output, and a calibration signal used when aligning the tuned circuits with the indication on the dial tape. The output frequency of the tuner depends on the band selected and is as follows:

BAND	FREQUENCY
1	455 kilohertz
2	455 kilohertz
3	455 kilohertz
4	455 kilohertz
5	2.9 Megahertz
6	2.9 Megahertz
7	10.7 Megahertz
8	10.7 Megahertz
9	10.7 Megahertz
10	10.7 Megahertz

d. 2.9 MEGAHERTZ INTERMEDIATE FREQUENCY AMPLIFIER MODULE. - The output of the tuner is applied to the 2.9 Megahertz imtermediate frequency amplifier module. The 455 kilohertz input on bands 1 through 4 is routed by BAND switch S1 directly to the 455 kilohertz output. The 2.9 Megahertz input on bands 5 and 6 is mixed with an internal 3.355 Megahertz oscillator to produce a difference frequency of 455 kilohertz which is then routed by the bandswitch to the 455 kilohertz output. The 10.7 Megahertz input on bands 7 through 10 is routed by the bandswitch directly to the 10.7 Megahertz output. Both the 455 kilohertz and the 10.7 Megahertz output are applied to the Bandwidth module.

e. BANDWIDTH MODULE. - The BANDWIDTH switch on the front panel activates circuits in the bandwidth module to provide either a narrow or wide bandwidth as follows:

FREQUENCY	6DB DOWN BANDWIDTH	
	NARROW	WIDE
Bands 1 through 6	6.0 kHz	10.0 kHz
Bands 7 through 10	40.0 kHz	120.0 kHz

The 455 kilohertz output from the bandwidth module is applied to the 455 kilohertz intermediate frequency amplifier module and the 10.7 Megahertz output of the bandwidth module is applied to the 10.7 Megahertz intermediate frequency amplifier module.

f. 455 KILOHERTZ INTERMEDIATE FREQUENCY AMPLIFIER MODULE. - The 455 kilohertz amplifier amplifies the incoming signal and provides an amplitude-modulated audio output, a 455 kilohertz intermediate frequency output and an automatic gain control voltage output. The audio output is routed through the BAND switch and an audio gating circuit in the 2.9 Megahertz module for bands 1 through 6, then to the AM position of the AM-FM switch. With the AM-FM switch in the AM position, the signal is then applied through the VOLume control to the audio module. The gating circuit in the 2.9 Megahertz amplifier module provides a means of blocking the audio output when the beat frequency oscillator (BFO) is switch on. The 455 kilohertz output is applied to the BFO module. The automatic gain control output is applied through the BAND switch in the 2.9 Megahertz amplifier module to the AGC switch which, when in the AGC position, applies the voltage to the input stage in the 455 kilohertz amplifier module and to the tuner module. The automatic gain control

voltage automatically sets the gain of the receiver. When the AGC switch is in the OFF position, the manual RF ATT control replaces the automatic gain control voltage and allows manual setting of the gain of the receiver.

g. 10.7 MEGAHERTZ AMPLIFIER MODULE. - The 10.7 Megahertz amplifier module receives the 10.7 Megahertz output of the bandwidth module, amplifies the signal and provides (1) a 10.7 Megahertz output (2) amplitude modulated audio output, (3) an FM audio output, (4) an automatic gain control voltage output, and (5) an automatic frequency control voltage output. The amplitude modulated output is available on bands 7 through 10 and is routed in the same manner as the AM output on the 455 kilohertz IF amplifier. The frequency modulated output is applied to the AM-FM switch where in the FM position, the signal is routed through the VOLume control to the audio module. The automatic gain control voltage output operates in the same manner as the automatic gain control voltage in the 455 kilohertz amplifier. The automatic frequency control voltage output is applied to the AFC switch. When the AFC switch is in the AFC position, the output is applied back to the tuner module to correct the oscillator frequency, thus maintaining a 10.7 Megahertz IF center frequency for the receiver.

h. BEAT FREQUENCY OSCILLATOR MODULE. - The BFO module receives the 455 kilohertz input on bands 1 through 6 and the 10.7 Megahertz input on bands 7 through 10. When the BFO control is turned on, the intermediate frequency signal is mixed with an internal oscillator to produce a beat frequency (audio tone). The tone is varied by the BFO control to obtain the desired pitch. The audio tone is applied out through the AM-FM switch in the AM position and through the volume control to the audio module. When the BFO control is turned on, the AM audio output originating in the 455 kilohertz amplifier module or 10.7 Megahertz amplifier module is blocked by the gating circuit in the 2.9 Megahertz module. This action prevents passage of undesired audio signals from the envelope detector when the beat frequency oscillator is in operation.

i. AUDIO MODULE. - The VOLume control sets the audio level at the input to the audio module. The audio signal is amplified in the audio module and applied to the headset, or external speaker and/or to an external tape recorder. An accessory microphone can be connected to the receiver to insert information onto the tape recorder tape when desired. The automatic gain control voltage is applied to an amplifier in the audio module. The amplified voltage is then applied through the METER switch to the front panel meter to indicate relative signal level.

(1) The METER switch also has positions for connecting the battery to the meter to determining battery condition, and two positions for operating the Frequency Calibrator circuit.

j. FREQUENCY CALIBRATOR MODULE. - The frequency calibrator provides either of two outputs which are rich in harmonics. These are 100 kilohertz and 1 Megahertz. The outputs are applied to the tuner module for calibration of the receiver. When the front panel PUSH TO CAL button is pressed and held, the dial tape is locked in position. The tuning capacitors can still be positioned by the front panel TUNING control through a slip clutch. This allows the tuning capacitor and dial tape to be accurately aligned.

k. POWER SUPPLY MODULES. - Either of two power supplies can be used. Power Supply PP-4834/PRR-15 operates on either 24 VDC or 120 VAC 50 to 400 Hertz. Power Supply PP-4833/PRR-15 operates from either 8 size D cells or 9 size C cells.

4-4. FUNCTIONAL SECTION DESCRIPTION.

a. RF INPUT CIRCUIT.

(1) CIRCUIT DESCRIPTION. - The RF input signal can be fed into the receiver through either the WHIP antenna or EXT antenna input connectors (Figure 4-2). The EXT antenna input is matched to a 50 ohm input impedance on all bands. The WHIP antenna is a high impedance on bands 1 through 6 and transferred to a 50 ohm impedance on bands 7 through 10.

(a) When the ANT SEL switch is in the EXT position, the signal at the EXT connector J6 is routed through the ANT SEL switch A1A9S8 to the 50 ohm input of the tuner. At the same time the input from the WHIP antenna input at J5 is grounded. Also the input from the calibrator oscillator module is completed to the 50 ohm input of the tuner through connector J10, capacitor C4 and the ANT SEL switch A1A9S8.

Note

The calibrator output can only be applied to the tuner when the ANT SEL switch is in the EXT position and the calibration oscillator module is energized by the METER switch.

(b) When the ANT SEL switch is in the WHIP position, the EXT antenna input and calibrator oscillator input are disconnected. The RF input at WHIP antenna input J5 is routed through ANT SEL switch A1A9S8 to switch section A1A3S1E contact 3. On bands 1 through 6 the signal is passed to contact 8 and then to the high impedance input of the tuner. On bands 7 through 10, switch A1A3S1E routes the signal from contact 3 through 2 then back through ANT SEL switch A1A9S8 to the 50 ohm input of the tuner.

(c) The transfer from high impedance to 50 ohm impedance is incorporated to provide a better match across the frequencies spectrum since the impedance of the whip antenna will decrease with an increase in frequency.

(d) Thus, by providing an automatic crossover point a high energy transfer through the frequency range of the receiver is provided.

(2) TEST DATA. - The RF input circuit can be checked by performing a continuity check in accordance with the following chart:

CONTROL		FRONT PANEL A1A9			2.9MHz IF A1A3	
BAND	ANT SEL	J5	J6	J8	P5	GRD
1 to 10	EXT	X				X
1 to 10	EXT		X	X		
1 to 6	WHIP	X			X	
7 to 10	WHIP		X		X	

Note: X indicates continuity between indicated points. A blank indicates no continuity between points. Figure 4-2 provides a simplified schematic of this circuit, which provides sufficient information for troubleshooting.

b. TUNER MODULE

(1) FUNCTIONAL DESCRIPTION. - The tuner module, Figure 4-3 is divided into four sections. These are the antenna section, the radio frequency amplifier section, the mixer section, and the local oscillator section.

(a) The incoming radio frequency signal is applied from the 50 ohm impedance input through BAND switch S1A rear and one of the antenna transformers T1 through T10 to gate 1 of the RF amplifier Q1 on all bands. The high impedance input is applied through S1B front and rear on bands 1 through 6, directly to gate 1 of RF amplifier Q1. The output at the drain of Q1 is applied to RF amplifier Q3. An AGC control voltage is applied to gate 2 of both Q1 and Q3. Additional AGC control is provided by returning the source of Q1 and Q3 through AGC control transistor Q2. The impedance of Q2 is determined by the incoming AGC voltage level and this in turn controls the gain of Q1 and Q3. The output of Q3 is fed to gate 1 of mixer Q4. Gate 2 of Q4 receives the output from the local oscillator Q5 and Q6. The difference signal produced by mixer Q4 is fed to the 2.9 Megahertz IF amplifier module. The IF output signal from the tuner for the various bands is as follows:

Bands 1 through 4	455 kilohertz
Bands 5 and 6	2.9 Megahertz
Bands 7 through 10	10.7 Megahertz

An automatic frequency control (AFC) voltage is applied to the tuner when the BAND switch is set to bands 7 through 10 during FM operation. The AFC voltage is applied to diode CR1 which functions as a variable capacitor, changing the local oscillator frequency as required to maintain a center frequency of 10.7 Megahertz from the mixer.

(2) CIRCUIT DESCRIPTION. - The operation of the tuner is basically identical on all bands, therefore operation will be described for band 10 only. Figure 4-4 is a simplified schematic.

(a) RF SIGNAL CIRCUIT. - (See Figure 4-4). The incoming radio frequency signal is applied

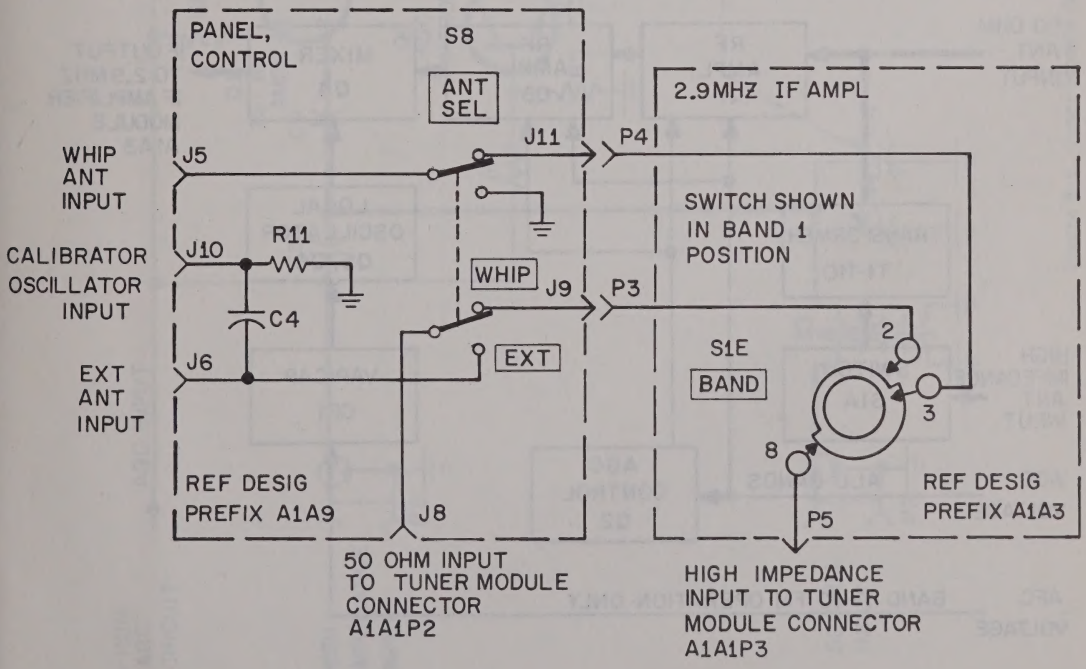

Figure 4-2. Antenna Circuit, Simplified Schematic Diagram

through either the high impedance input P3 or low impedance P2 input. The desired antenna input is selected by front panel ANT SEL switch A1A9S8 and BAND switch S1E on the 2.9 MHz IF amplifier as shown on Figure 4-2. When the high impedance input is in operation, (available on bands 1 through 6) the RF signal is fed through P3, C33 and C9 directly to gate 1 of RF Amplifier Q1. When the 50 ohm impedance is in operation, the incoming RF signal is applied through P2. For band 10 operation, the RF signal is applied through P2 to the primary of T10. The secondary of T10 is parallel with C4 and C44 and is also connected through C9 to gate 1 of RF amplifier Q1. Transformer T10 and capacitor C44 are adjusted during alignment of the receiver. Capacitor C4 is part of the capacitor gang associated with the front panel TUNING control and sets the resonant point for the input tuned circuit.

(b) The RF signal at gate 1 of Q1 is amplified and appears at the drain where it is then applied through C13 and C15 to gate 1 of RF amplifier Q3. A parallel resonant tank circuit composed of L10, C3 and C58 is connected to the Q3 input. Inductor L10 and capacitor C58 are adjusted during alignment and capacitor C3 is part of the capacitor gang associated with the front panel TUNING Control. The output at the drain of Q3 is applied through C20 and C21 to gate 1 of mixer Q4. A parallel resonant circuit composed of L20, C2 and C72 is connected at gate 1 of the mixer. Inductor L20 and capacitor C72 are adjusted during alignment. Capacitor C2 is used for tuning the receiver. The mixer also receives the output of the local oscillator at input gate 2. The output at the drain of mixer Q4 will contain the difference frequency which is applied through P4 to the 2.9 Megahertz IF module. The output tuned circuit for the mixer will be in either the 2.9 Megahertz module or the bandwidth module depending on the band selected. When operating on bands 1 through 4, the mixer load will be 455 kilohertz input of the bandwidth module. When operating on bands 5 and 6, the mixer load will be the input circuit of the 2.9 Megahertz IF amplifier. When operating on bands 7 through 10, the mixer load will be the input to the 10.7 Megahertz circuit in the bandwidth module. Selection of the correct load is determined by switching circuits within the 2.9 Megahertz module. The dc operating voltage for the mixer is applied through the load in either the 2.9 Megahertz IF amplifier module or the bandwidth module as determined by the band in use.

(c) LOCAL OSCILLATOR. - A simplified schematic of the local oscillator circuit for band 10 is shown in Figure 4-5. Transistors Q5 and Q6 form an oscillator circuit with Q5 controlling the feedback. The parallel tuned circuit consists of L30, C94, C1 and C96 and is connected to the collector of Q6. In order to provide proper tracking across the band, three-point tracking is used. Inductor L30 is adjusted at the low end of the band, shunt padder C96 is adjusted at the high end of the band, and series padder C94 is a fixed value selected to provide a midpoint crossover.

(d) Feedback transistor Q5 is a field effect transistor connected in the emitter circuit of Q6 to provide feedback through C28. The voltage at the

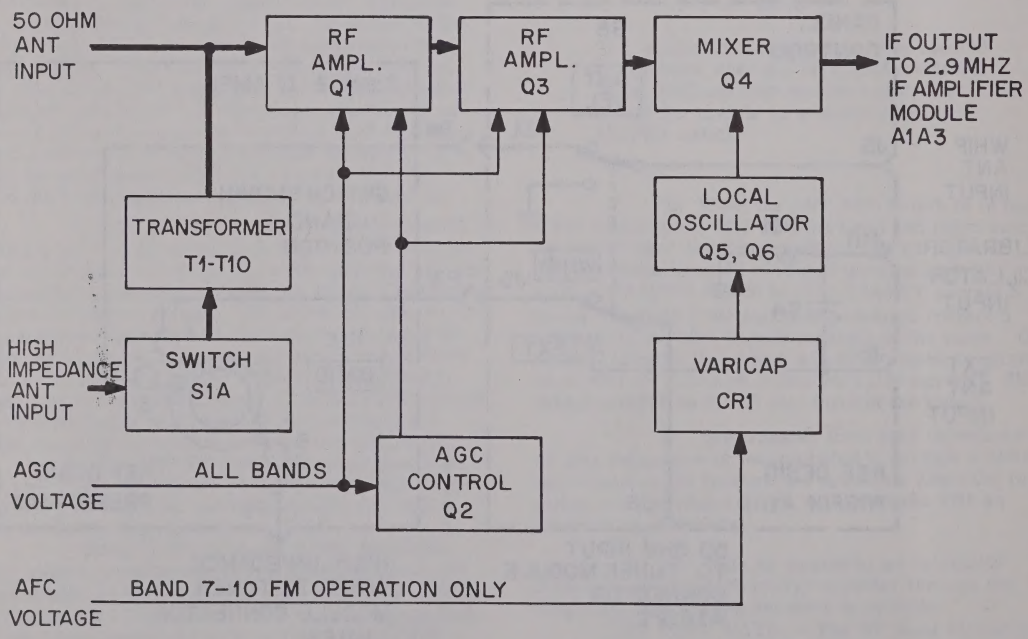

Figure 4-3. Tuner Module A1A1, Block Diagram

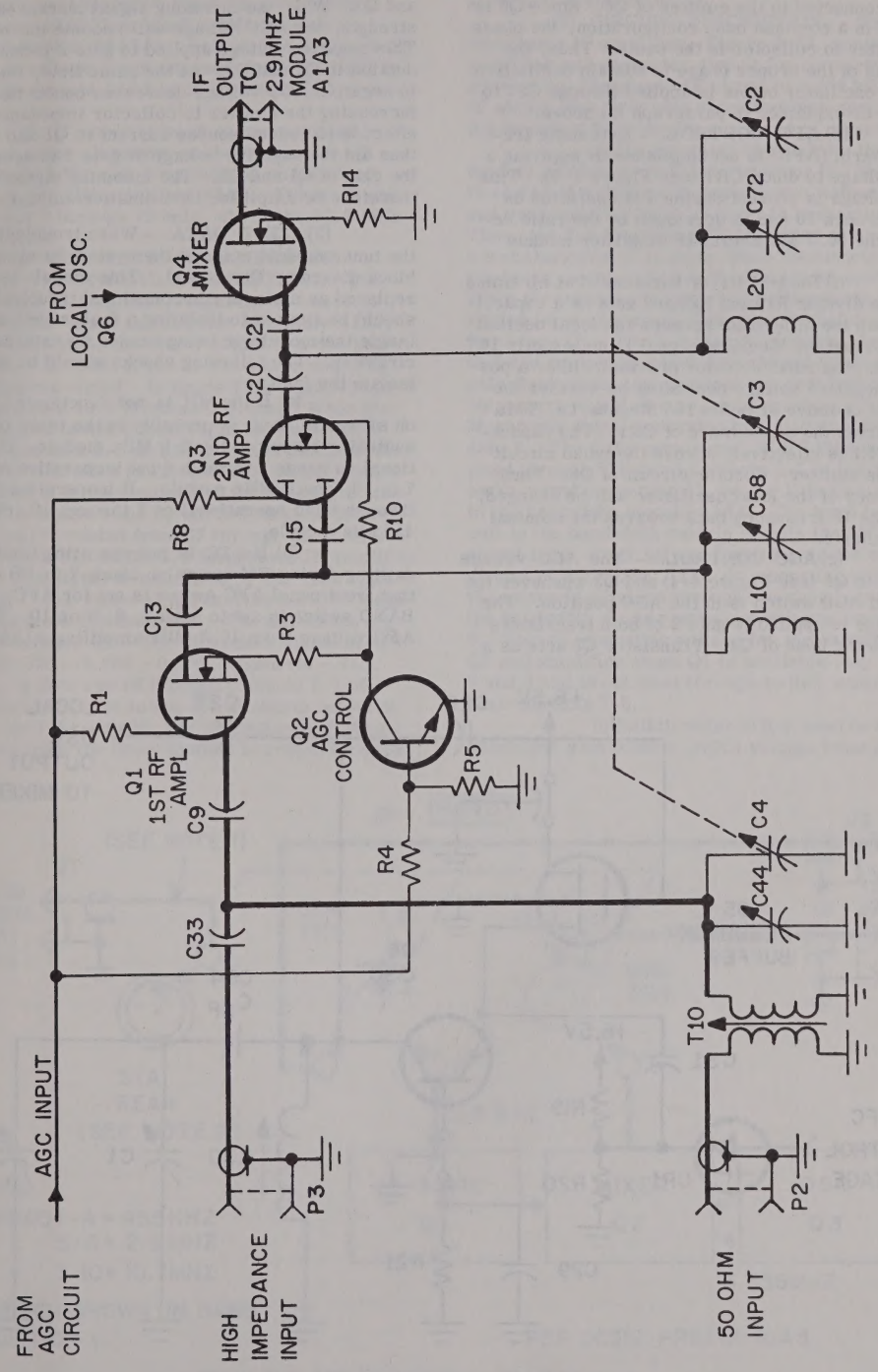

Figure 4-4. Tuner Module Band 10, Simplified Schematic Diagram

gate of Q5 is in the same phase as at the source which is connected to the emitter of Q6. Since Q6 is connected in a common base configuration, the phase from emitter to collector is the same. Thus, the feedback is of the proper phase to sustain oscillation. The local oscillator output is applied through C27 to the mixer as explained in paragraph (a) above.

(e) AFC CONTROL. - Automatic frequency control (AFC) is accomplished by applying a control voltage to diode CR1 (see Figure 4-5). This control voltage is present during FM operation on bands 7 through 10 and is developed by the ratio detector in the 10.7 Megahertz IF amplifier module A1A6.

(f) Diode CR1 is backbiased at all times by voltage divider R19 and R20 and acts as a capacitance. When the difference between the local oscillator voltage and the incoming signal is not exactly 10.7 Megahertz, the ratio detector provides either a positive or negative voltage depending on whether the frequency is above or below 10.7 Megahertz. This voltage varies the capacitance of CR1. The capacitance of CR1 is effectively across the tuned circuit through the emitter-collector circuit of Q6. Thus, the frequency of the local oscillator will be changed, bringing the IF frequency back towards the nominal 10.7 Megahertz.

(g) AGC CONTROL. - The AGC voltage is applied to Q1 (see Figure 4-4) and Q3 whenever the front panel AGC switch is in the AGC position. The AGC voltage is applied to gate 2 of both transistors and also to the base of Q2. Transistor Q2 acts as a variable impedance in series with the sources of Q1 and Q3. When the incoming signal increases in strength, the AGC voltage will become more negative. This negative voltage applied to gate 2 reduces conduction in Q1 and Q3. At the same time, the increase in negative AGC voltage decreases conduction of Q2, increasing the emitter to collector impedance. The effect is to reduce source current to Q1 and Q3 and thus aid the negative voltage at gate 2 in decreasing the gain of Q1 and Q3. The incoming signal will therefore be amplified by a smaller amount.

(3) TEST DATA. - When troubleshooting the tuner module refer to the system functional block diagram, Figure 4-1. This module is to be replaced as a single component and troubleshooting should be limited to isolating a fault either as being inside the module or being caused by external circuitry. The following checks should be made to isolate the fault:

(a) If the AGC is not functioning properly on all bands, fault is probably in the tuner or the switching circuit in the 2.9 MHz module. If operational on bands 1 through 6 but inoperative on bands 7 to 10, check MHz module. If inoperative on 1 through 6 but operational on 7 through 10, check 455 kHz module.

(b) If AFC is not operating (indicated by drifting during FM operation bands 7 to 10) check that front panel AFC switch is set for AFC, and BAND switch is set to band 7, 8, 9 or 10. Check AFC voltage from 10.7 MHz amplifier A1A6.

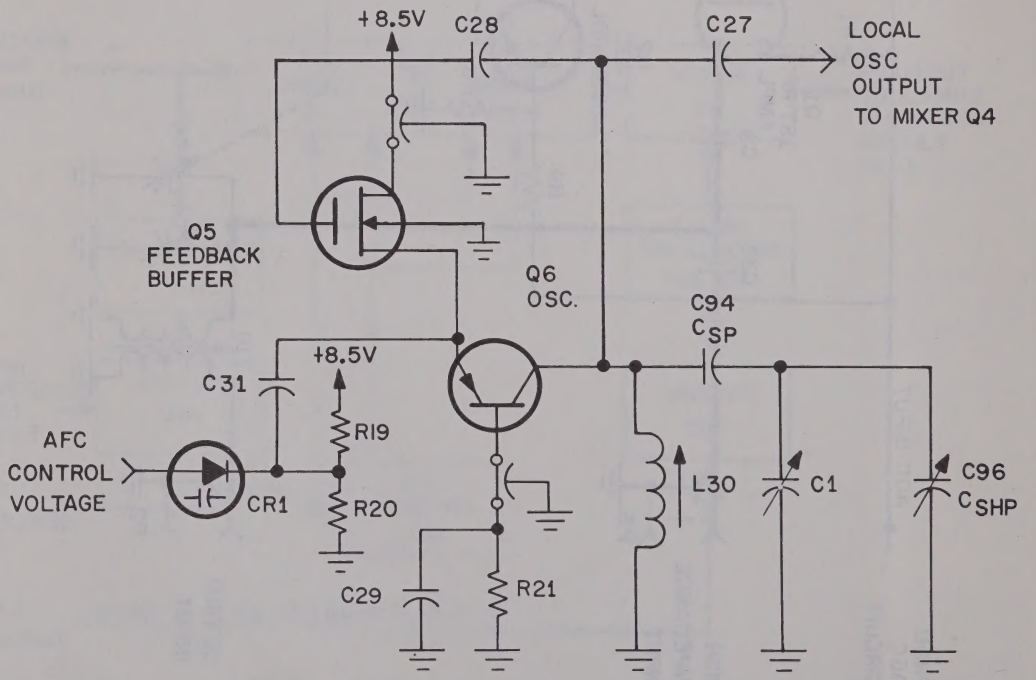

Figure 4-5. Local Oscillator Simplified Schematic Diagram

(c). If only one band is inoperative, set BAND switch to inoperative band, then disconnect A1A1P4 from A1A3J2 on the 2.9 MHz module. Measure voltage at A1A3J3. Voltage should be +8.5 volts dc. If voltage is not present, fault is in either the 2.9 MHz module A1A3 or in the bandwidth module A1A4.

(d). If output is weak on one particular band, check tuner alignment on the weak band. If weak on bands 1 through 4 but normal on all other bands check 455 kHz amplifier A1A5. For weak signals on bands 7 through 10 only, check the 10.7 MHz amplifier A1A6.

c. 2.9 MEGAHERTZ IF AMPLIFIER.

(1) FUNCTIONAL DESCRIPTION. - The 2.9 Megahertz IF amplifier, Figure 4-6, receives the output of the mixer in the tuner assembly A1A1. In bands 1 through 4, the mixer output is a 455 kilohertz signal. In bands 5 and 6, the mixer output is a 2.9 Megahertz signal. In bands 7 through 10, the mixer output is a 10.7 Megahertz signal. When the incoming signal is 455 kilohertz, it is routed from J2 through contacts 2-1 of BAND switch S1A and contacts 12-1 of S1B front to the kilohertz output connector J1, where it is then applied to the bandwidth module A1A4. In bands 5 and 6, the 2.9 Megahertz incoming signal is routed from J2 through contacts 2-5 of BAND switch S1A to the 2.9 Megahertz IF amplifier stage Q1. The signal is amplified by Q1, then applied to mixer Q2. The mixer also receives a 3.355 Megahertz signal from oscillator Q3. The difference signal from oscillator Q3. The difference signal of 455 kilohertz (3.355 - 2.900 = 0.455 Megahertz = 455 kilohertz), is then routed through contacts 5-1 of BAND switch S1B front to the 455 kilohertz output at J1. In bands 7 through 10, the incoming 10.7 Megahertz signal from the tuner module is routed through contacts 2-8 of BAND switch S1A to the 10.7 Megahertz output connector J3.

(2) CIRCUIT DESCRIPTION. - The 2.9 Megahertz IF amplifier, Figure 5-33, contains an amplifier and converter circuit for converting an incoming 2.9 Megahertz IF signal to a 455 kilohertz IF signal plus switching circuits which perform switching functions for circuits contained in other modules.

(a)The incoming signal from the tuner module A1A1 when at 455 kilohertz or 10.7 Megahertz is routed directly out through switch wafers S1A front and rear and S1B front to J1 or J3 respectively. Thus, the 2.9 Megahertz IF amplifier is used only as a switching center to route these frequencies from the tuner module A1A1 to the bandwidth module A1A4. When the incoming signal is 2.9 Megahertz, it is routed from J2 through S1A contacts 2-5 to IF amplifier stage Q1. The 2.9 Megahertz signal is amplified and applied to mixer Q2. Mixer Q2 is a dual-gate field-effect transistor which receives the 2.9 Megahertz signal at gate 1 and receives a 3.355 Megahertz signal generated by oscillator stage Q3 at gate 2. The difference signal of 455 kilohertz is applied through S1B front contacts 5-1 to the 455 kilohertz output connector J1, where it is then applied to the bandwidth module A1A4. The input tuned circuit in the bandwidth module selects the 455 kilohertz output from mixer Q2 and functions as the output load circuit of the mixer. The dc operating voltage for the mixer is obtained through the signal lead from the bandwidth module when operating in bands 5 and 6. The dc operating voltage for the oscillator stage Q3 and amplifier stage Q1 is available only in bands 5 and 6 and is obtained through switch wafer S1D rear contacts 7-8.

(b)Switch wafer S1B is used to select the automatic gain control (AGC) voltage from the 455

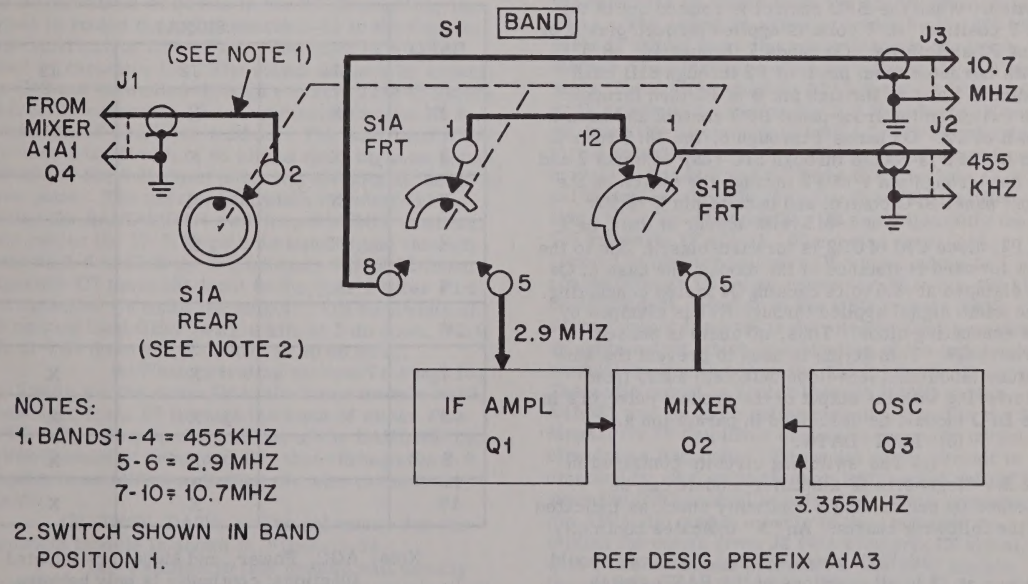

Figure 4-6. MHz IF Amplifier, Block Diagram

kilohertz IF module or the 10.7 Megahertz IF amplifier module. In bands 1 through 6 the AGC voltage from the 455 kilohertz IF amplifier module A1A5 is applied through S1B rear contacts 3-4 then through AGC-OFF switch A1A9S7 to the tuner module A1A1. In bands 7 through 10, the AGC voltage from the 10.7 Megahertz IF amplifier A1A6 is routed through S1B rear contacts 9-4 then through AGC-OFF switch A1A9S7 to the tuner module A1A1. Amplitude-modulated (a-m) audio from either the 10.7 Megahertz IF amplifier or the 455 kilohertz IF amplifier is routed through switch S1C front. In bands 1 through 6 the audio output from the 455 kilohertz IF amplifier module is applied from contact B of P1 through S1C front contact 1-4 to an electronic switching network. In bands 7 through 10, the audio output from the 10.7 Megahertz IF amplifier module is applied through contact D of P1 to S1C front contacts 7-4, then to the electronic switching network.

(c) The electronic switch network consisting of C24, Q4, CR1, CR2, R17, R18, R19 and R20 is used to automatically disable the audio input from the envelope detectors in either the 455 kilohertz IF amplifier module or the 10.7 Megahertz IF amplifier module when the beat frequency oscillator (BFO) is turned on. When the BFO is not activated (BFO control in the OFF position) no voltage is applied to contacts E or C of P2 therefore, CR1 and CR2 receive no anode voltage. A +8.5 volt input is applied to a voltage divider consisting of R18 and R19 which sets the base voltage of Q4 at approximately +2.3 volts. The emitter of Q4 is returned to the +8.5 volts supply through resistor R20 causing Q4 to conduct. The audio signal is applied through S1C front and through resistor R17 to the base of Q4. Emitter follower Q4 develops the audio signal across R20 and passes it through C24 to pin H of P1 where it is then routed to the AM section of the AM-FM switch. When the BFO control is rotated out of the OFF position, +8.5 volts is applied through pins C or E of P2 as follows. On bands 7 through 10, +8.5 volts is routed from pin D of P2 through S1D front contacts 5 and 6, through pin B of P2 then through the switch on the front panel BFO control and back to pin E of P2. On bands 1 through 6, the +8.5 volts at pin D of P2 is routed through S1C rear contacts 2 and 3, out through pin F of P2 through the switch on the front panel BFO control and back to pin C of P2.

(d) When +8.5 volts appear at Pin C or E of P2, diode CR1 of CR2 is forward-biased. Due to the low forward resistance of the diodes, the base of Q4 is clamped at +8.5 volts causing Q4 to stop conducting. The audio signal applied through R17 is clamped by the conducting diode. Thus, no audio is passed through Q4. This action is used to prevent the amplitude modulated (envelope detected) audio from interfering with the output of the product detectors in the BFO module as described in paragraph g.

(3) TEST DATA.

(a) The switching circuits contained in the 2.9 Megahertz IF amplifier module can be checked by performing a continuity check as indicated in the following charts. An "X" indicates continuity.

(b) With power applied, +8.5 vdc should appear at J2 in all positions of the BAND switch. Failure on bands 1, 2, 3, 4, 7, 8, 9 and 10 indicates a fault in the bandwidth module. Failure on bands 5 and 6 indicates a probable fault in the 2.9 Megahertz IF amplifier module. Failure of only one band of the group 1, 2, 3, 4, 7, 8, 9 or 10 indicates probable fault in the signal switching circuits of the 2.9 Megahertz IF amplifier module.

(c) Misalignment of the 2.9 Megahertz IF amplifier module will effect only bands 5 and 6.

d. BANDWIDTH CIRCUIT

(1) FUNCTIONAL DESCRIPTION. - A block diagram analysis of the bandwidth module is

BAND	AGC			POWER		
	P1			P2		
	A	E	C	F	D	B
1	X	X		X	X	
2	X	X		X	X	
3	X	X		X	X	
4	X	X		X	X	
5	X	X		X	X	
6	X	X		X	X	
7	X		X		X	X
8	X		X		X	X
9	X		X		X	X
10	X		X		X	X

BAND	SIGNAL		
	J1	J2	J2
1	X	X	
2	X	X	
3	X	X	
4	X	X	
5			
6			
7		X	X
8		X	X
9		X	X
10		X	X

Note: AGC, Power, and signal are isolated functions; continuity is only between pins of indicated function.

not required. Details of circuit operation are discussed in the following paragraph.

(2) CIRCUIT DESCRIPTION. - The bandwidth (Filter Selector) module, Figure 5-34, contains a separate narrow band and wide band filter for both the 455 kilohertz and the 10.7 Megahertz IF frequencies. On bands 1 through 6, the 455 kilohertz input is received at P1 and applied to the primary of T1, which is tuned to 455 kilohertz. The signal voltage from the secondary of T1 is applied to contact 10 of BANDWIDTH switch S1 rear. When the BANDWIDTH switch S1 is set to the WIDE position, the signal is routed out on contact 12 of filter FL2. At the same time, the input to filter FL1 is terminated through capacitor C3 by S1 rear contacts 5-8. Filter FL2 limits the bandwidth at the 6 db down points to approximately 10.0 kilohertz. The output from FL2 is routed through contacts 12-10 of S2 rear to connector P4 for application to the 455 kilohertz IF amplifier module. Contacts 8-5 of S2 rear ground the output of FL1 when FL2 is selected. When the BANDWIDTH switch is set to NARROW position, filter FL1 is selected by contacts 8-10 of S1 rear and contacts 8-10 of S2 rear. The selection of filter FL1 limits the 6db down bandwidth to approximately 6.0 kilohertz. A +8.5 volts operating voltage to the mixer stage D-4 in the tuner module A1A1 in bands 1 through 4 or the mixer stage in the 2.9 Megahertz IF amplifier module A1A3 is required. This voltage is obtained through P3 from the regulated +8.5 volt source and is fed through the filter consisting of L1, C5 and C6, then through the primary T1 and out through connector P1.

(a) The 10.7 Megahertz input is used for bands 7 through 10. This input is applied through connector P2 and transformer T2 to contact 9 of S1 front. Transformer T2 acts as a load for the mixer in the tuner module and is peaked at 10.7 Megahertz. When the BANDWIDTH switch is in the WIDE position, the signal is routed through contacts 9-11 to the input to wide band quartz filter FL3. The input to FL3 is tuned by capacitor C8. The output is tuned by capacitor C10 and is applied through contacts 11-9 of switch S2 front to connector P5 for application to the 10.7 Megahertz IF amplifier module. The wide band filter provides a bandwidth of 45 kHz at the 3 db down points, 120 kHz at the 6 db down point and 490 kHz at the 40 db down point. The narrow bandwidth is selected by setting the BANDWIDTH switch to NARROW position. This routes the 10.7 Megahertz input signal through contacts 9-6 of S1 front and contacts 6-9 of S2 front. Capacitor C7 tunes the input to the quartz filter FL4 and capacitor C9 tunes the output. The bandwidth of the narrow band filter is 27.0 kHz at 3 db down, 40.0 kHz at 6 db down and 60.0 kHz at 40 db down.

(b) When operating on band 7 through 10, a +8.5 volts for the mixer Q4 in the tuner module A1A1, is obtained from P3 through the input of either FL3 or FL4 depending on the position of the BANDWIDTH switch through S1 front and P2, then through the 2.9 Megahertz amplifier switching circuits to the tuner module.

(3) TEST DATA. - The schematic for the bandwidth module is shown in Figure 5-34.

(a) Failures in this module will usually occur in the switch wafer or one of the filter elements. The switches can be checked for continuity. Additional continuity checks can be performed as indicated below to check input and output circuits.

CONTINUITY CHECK

CONNECTOR	NARROW	WIDE
P1-P3	10 ohms	10 ohms
P2-P3	3.0 ohms	3.0 ohms
P4-GRD	∞	∞
P5-GRD	0.55 ohms	0.65 ohms

(b) +8.5 vdc should be present at P1 and P2 at all times equipment is energized.

(c) The filters can be isolated as probable faults as indicated below:

CONDITION	PROBABLE FAILURES
1. Failure bands 1 through 6 NARROW	FL1
2. Failure bands 1 through 6 WIDE	FL2
3. Failure bands 7 through 10 NARROW	FL3
4. Failure bands 7 through 10 WIDE	FL4

e. 455 KILOHERTZ IF AMPLIFIER CIRCUIT.

(1) FUNCTIONAL DESCRIPTION. - The 455 kilohertz IF amplifier, Figure 4-7, receives the 455 kilohertz IF output from the bandwidth module A1A4. The output is either provided by the 455 kilohertz IF output from the mixer stage in the tuner module A1A1 through switch circuits in the 2.9 Megahertz IF amplifier module A1A3 for band 1 through 4 or is produced by mixing the 2.9 Megahertz IF output from the tuner module with a 3.355 Megahertz signal produced in the 2.9 Megahertz IF amplifier module in bands 5 and 6. This 455 kilohertz IF signal is applied through J1 to the first IF amplifier stage Q1. Transistors Q1, Q2 and Q4 amplify the 455 kilohertz IF signal. The output from Q4 is coupled to emitter follower Q5 whose output is routed through IF output connector J2 to the 455 kilohertz product detector in the BFO module A1A7. A second output from Q4 is detected by CR1 providing an audio output which is a function of the amplitude modulation (envelope) on the 455 kilohertz IF signal. The audio output is routed through BAND switch A1A3S1 and an audio gating circuit located in the 2.9 Megahertz IF amplifier module to the audio output circuits as AM audio. The audio gating circuit is disabled by +8.5 volts through BFO switch A1A9S1 when the BFO control is activated. This removes the AM audio output. Audio is then obtained by mixing the output from J2 (455 kilohertz IF signal) with a second signal produced in the BFO module (see paragraph g(1) below). The output from detector CR1 is also applied to an integrator which converts

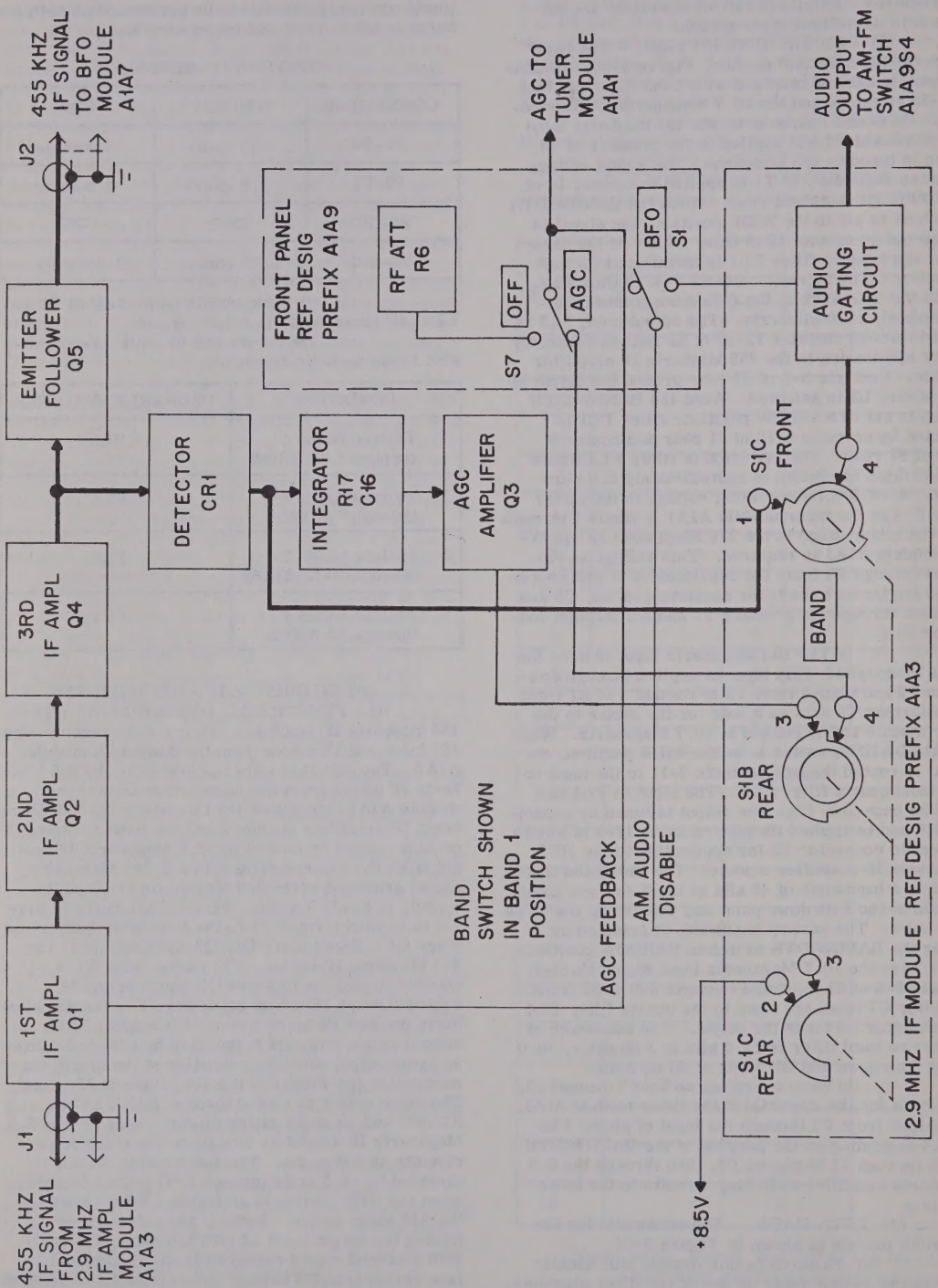

Figure 4-7. 455 kHz IF Amplifier, Block diagram

the audio signal into a dc voltage level which is a function of the amplitude of the audio signal. This dc level is used as the automatic gain control (AGC) voltage and is applied to AGC amplifier Q3. The output of Q3 is routed through BAND switch wafer A1A3S1B rear and through AGC-OFF switch A1A9S7 in the AGC position, then to both the first stage of this amplifier module and to the tuner module to control stage gain. When the AGC switch is in the OFF position, the RF ATT control A1A9R6 sets a fixed gain level for the receiver.

(2) CIRCUIT DESCRIPTION. - The amplitude-modulated or cw input to the 455 kilohertz IF amplifier, Figure 5-35, is fed through connector J1 to the base of amplifier Q1. Amplifier Q1 also receives an AGC voltage when the front panel AGC switch is in the AGC position, or a fixed dc level set by the front panel RF ATT control when the AGC switch is in the OFF position. This voltage sets the operating point of amplifier stage Q1 and therefore the gain of the stage. The output of Q1 is tuned to 455 kilohertz by T1. The signal is further amplified by Q2 with the primary of transformer T2 providing the collector load. Transformer T2 is tuned to 455 kilohertz and the output from the secondary of T2 drives amplifier Q4 which then provides two outputs. One output is coupled through emitter follower Q5 and connector J2 and is applied to the BFO module for detection of cw signals or for single sideband reception. The second output is developed across T3 which is tuned to 455 kilohertz. The output from T3 is detected by envelope detector CR1. The negative envelope output (audio signal) is filtered by C25, C26, R21 to remove any IF component in the signal. This leaves only the envelope (audio signal) which is a function of the amplitude modulation on the 455 kilohertz IF signal. The audio signal is applied both through pin H of P1 for distribution to the audio circuitry (paragraph h below) and to an integrator consisting of C16 and R17. The integrated signal provides a dc level with the audio removed to AGC emitter follower Q3. The dc level is a function of the signal level and is applied from the collector of Q3 through a filter consisting of capacitors C12 and C13 and inductor L4 as the AGC voltage. Variable resistor R11 acts as a preset gain control, setting the quiescent gain level of Q4. This control is adjusted to set the proper feedback level for the AGC function.

(a) The +8.5 volt operating potential for the 455 kilohertz IF amplifier module is applied to pin C of P1, by a section of the BAND switch in the 2.9 Megahertz IF amplifier module, only when bands 1 through 6 are selected.

(b) The AGC voltage at the collector of Q3, Figure 4-8, is smoothed by the filter consisting of C12, C13 and L4 and applied through BAND switch wafer S1B rear contacts 3-4 to the AGC position of the front panel AGC switch A1A9S7. When the AGC switch is in the AGC position, the AGC voltage is applied out to IF amplifier Q1 and also to the first and second RF amplifier stages Q1 and Q3 in the tuner module A1A1.

(3) TEST DATA.

(a) Refer to Figure 5-35 for a schematic diagram of this module and to Figures 4-23 and 4-24 for the servicing block diagrams.

(b) Voltage and resistances at P1

	A	B	C	D	E	F	H
V	0	+2.4 to +4.4	+8	–	+1.2 to +2.4	–	7.6
R	0	44K	2800	–	8500	–	∞

Note: Voltages measured with no signal input. Resistance measurements will vary with polarity of multimeter. All resistance measured to ground with P1 disconnected.

(c) Audio output at P1-H shall be 80mv ± 40 mv for a 455 kHz input at a level of 10μ 30%-modulated with 1000 Hz at connector J1.

(d) AGC level at P1-E should be 2.3V ± 0.5V for an input level of 1000μV at J1 and with pin E and B of P1 jumpered. If proper level is not indicated, refer to paragraph 5-4b(2) for adjustment of R11.

f. 10.7 MEGAHERTZ AMPLIFIER.

(1) FUNCTIONAL DESCRIPTION. - The 10.7 Megahertz IF amplifier, Figure 4-9, receives the 10.7 Megahertz IF output of the bandwidth module A1A4 at connector J1. This IF signal is amplified by stages Q1, Q2 and Q3. The output from the fourth IF amplifier Q4 is further amplified by Q5 then applied to the ratio detector. The output of the ratio detector is applied to both the FM position of the FM-AM switch for application to the audio circuits as FM audio and through an integrator circuit to the automatic frequency control (AFC) circuit in the tuner module A1A1 to automatically provide correction for frequency error. The output from amplifier Q6 is rectified by envelope detector CR1 producing an AM audio output which is applied to the 2.9 Megahertz IF amplifier where it is further processed as explained in paragraph c(1) above. The output from detector CR1 is also integrated by C48 and R36 then applied through driver Q9 and emitter follower Q8. The output of Q8 is filtered to provide the automatic gain control (AGC) voltage required to stabilize the receiver gain.

(a) The output from emitter follower Q7 is applied through connector J2 to the beat frequency oscillator (BFO) module for further processing as explained in paragraph g(1) below.

(2) CIRCUIT DESCRIPTION. - IF amplifier stages Q1, Q2, Q3, Q4 and Q5, Figure 5-36, are basically identical and form a cascade amplifier. The input 10.7 Megahertz signal is applied through J1 to the base of Q1. Transformers T1, T2, T3 and T4 provide a tuned collector load for Q1, Q2, Q3 and Q4, respectively. The output of each transformer is tapped to provide the proper impedance match for the following stage. The IF output from Q3 is also applied to stages Q6 and Q7.

(a) Amplifier Q6 output is rectified by CR1 providing a negative polarity output which is a function of the amplitude modulation of the 10.7 Megahertz signal. A filter consisting of capacitors C45 and C46 and resistors R24 and R29 removes the 10.7 Megahertz IF leaving only dc and the audio signal. This signal is applied out pin E of P1 as the AM au-

dio for distribution and is also applied to the automatic gain control (AGC) circuit.

(b) The AGC voltage is developed from the carrier rectification. The audio signal is removed by integrator R36 and C48, Figure 4-10, and applied to AGC amplifier Q9. The dc level at the collector of Q9 is applied through emitter follower Q8 through BAND switch wafer S1B rear contacts 9-4 to the AGC position of the AGC switch A1A9S7. In the AGC position of the AGC switch, the AGC voltage is applied to IF amplifiers Q1 and Q2 and also to the first and second RF amplifier stages Q1 and Q3 in the tuner module A1A1.

(c) Stage Q7, Figure 5-36, is an emitter follower which provides a low impedance output to couple the 10.7 Megahertz IF signal to the product detector in the BFO module (see paragraph g(2) below) for further processing.

(d) The output from amplifier Q5 is applied to a ratio detector which demodulates the frequency variation providing an FM audio output. The IF signal is removed by the filter consisting of inductors A1A6A1L3 and L4 and capacitor A1A6A1C10, C11 and C12, thus providing an output signal (audio) which is a function of the frequency deviation (modulation) of the 10.7 Megahertz signal. This audio output is applied through pin H of P1 as the FM audio signal for distribution. The FM signal is integrated by resistor R39 and capacitors C50 and C51. If the average value of the FM signal is not zero, it is an indication that the center frequency is not at 10.7 Megahertz. This results in either a positive or negative output from the integrator depending on whether the signal was above or below its nominal 10.7 Megahertz. This control voltage is fed out through pin F of P1 to the AFC switch, Figure 4-11, on the front panel. When the AFC switch is in the AFC position, this control voltage corrects the frequency of the local oscillator in the tuner module A1A1 maintaining a 10.7 Megahertz IF center frequency. When the AFC switch is in the OFF position, the AFC control voltage is disconnected and the AFC input to the tuner is grounded.

(3) TEST DATA.

(a) Refer to Figure 5-36 for a schematic diagram and to Figure 4-25 for the servicing block diagram.

(b) Voltage and resistances at P1

	A	B	C	D	E	F	H
V	0	+4.3	+3.2	+8.0	+7.4	+0.2	0
R	0	34K	1500	2600	∞	30K	∞

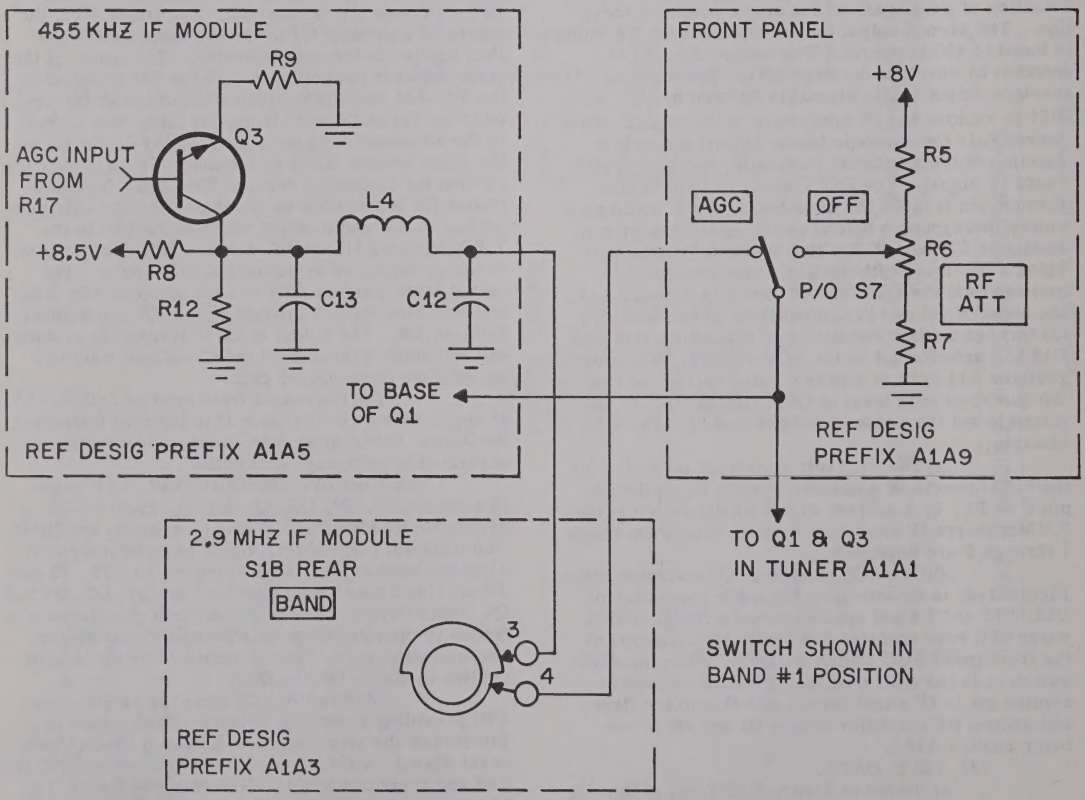

Figure 4-8. 455 kHz AGC Circuit, Simplified Schematic Diagram

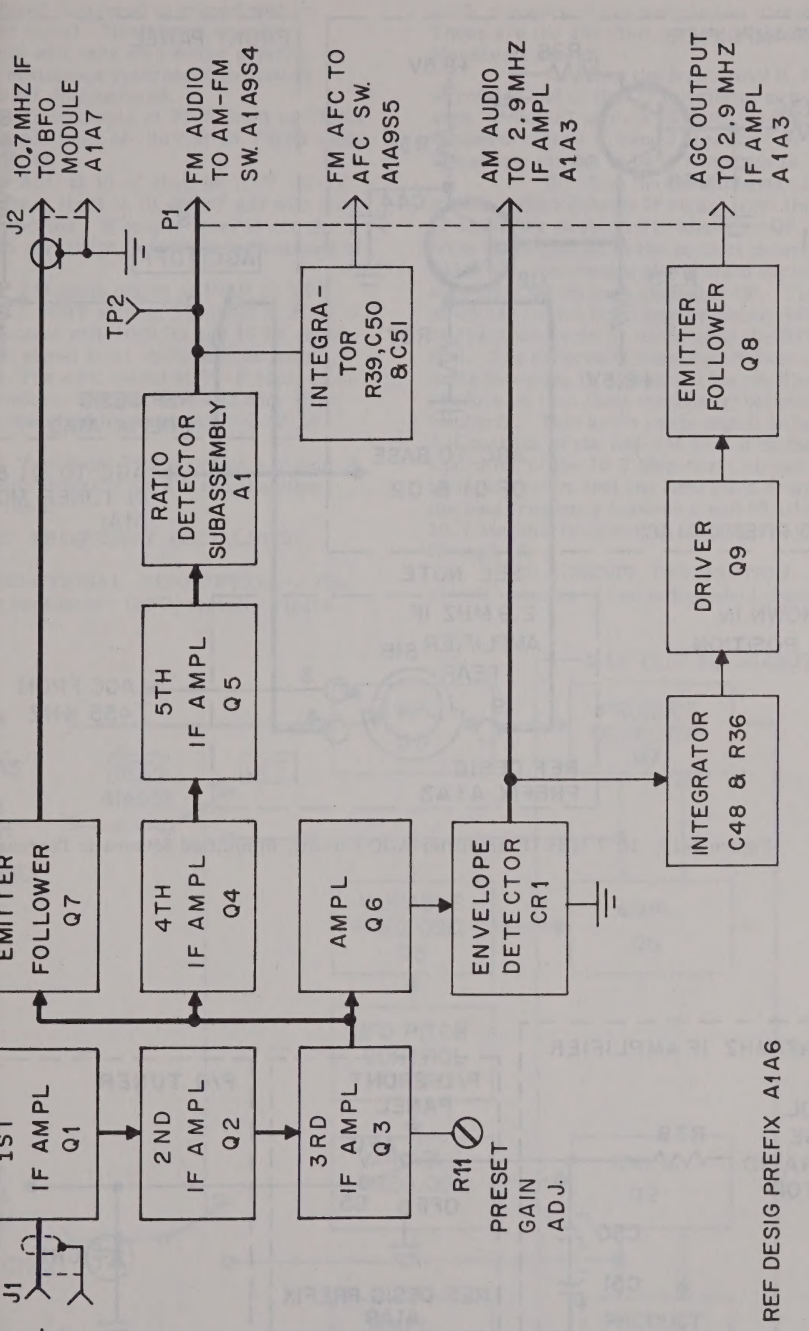

Figure 4-9. 10.7 MHz IF Amplifier, Block Diagram

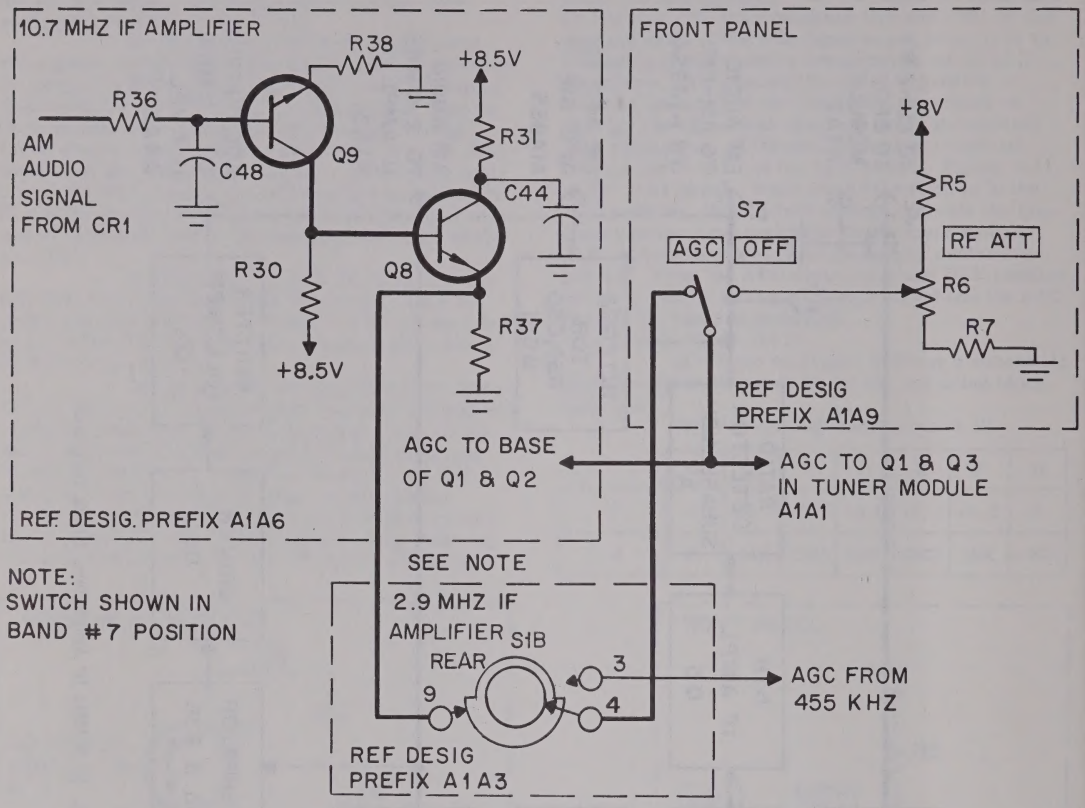

Figure 4-10. 10.7 MHz IF Amplifier AGC Circuit, Simplified Schematic Diagram

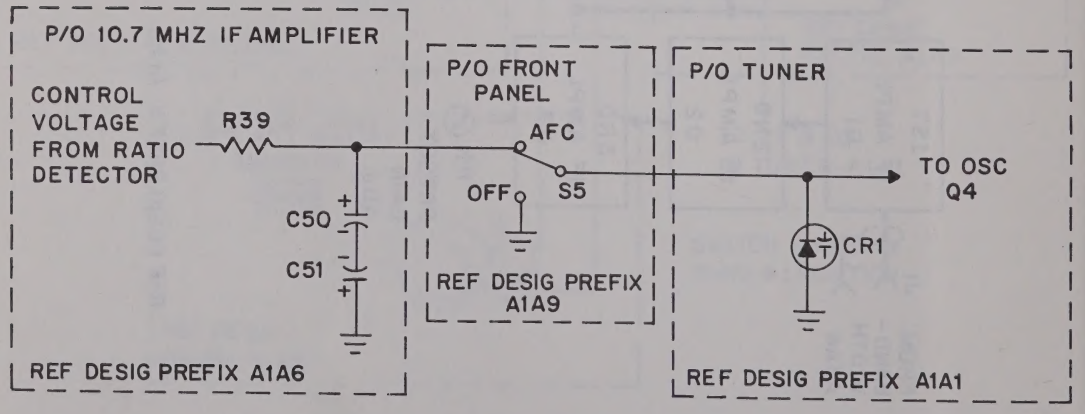

Figure 4-11. 10.7 MHz IF Amplifier AFC Circuit, Simplified Schematic Diagram

Note: Voltages measured to ground with no input signal. Resistance measurements will vary with meter polarity. All resistance referenced to ground with P1 disconnected.

(c) Audio output at P1-E shall be 120MV ± 35MV with an AM input of 10μV at 10.7 MHz modulated with 1000 Hz.

(d) AGC at P1-C shall be 1.5V ± 0.2V with an input signal level of 10,000μV and with pins C and B of P1 shorted. If proper level is not obtained, refer to paragraph 5-4b(3) for adjustment of R10.

(e) FM audio output at P1-H or TP2 shall be 100MV ± 30MV with an FM input at J1 of 10.7 MHz modulated with 1000 Hz and 15 Hz deviation. The input signal level shall be 0.01 volts.

(f) The AFC output at P1-F shall be an "S" shaped waveform 350 kHz ± 50 kHz wide when the sweep test specified in paragraph 5-3c(2) is performed.

(g) Test point TP1 provides a means of checking the ratio detector for a 0 vdc condition with no signal input.

g. BEAT FREQUENCY OSCILLATOR CIRCUIT.

(1) FUNCTIONAL DESCRIPTION. - The beat frequency oscillator (BFO) circuit, Figure 4-12, consists of two independent circuit groups. These are the 455 kilohertz circuit and the 10.7 Megahertz circuit.

(a) When the front panel B.F.O. control is rotated out of the OFF position, switch S1 is activated. Switch S1 applies +8.5 volts to either the 455 kilohertz circuit in band 1 through 6 or to the 10.7 Megahertz circuit in band 7 through 10.

(b) When the 455 kilohertz circuit is energized, a 455 kilohertz IF signal from the 455 kilohertz IF amplifier is applied to amplifier Q8. The output from Q8 is applied to the product detector (mixer) which also receives a signal from variable frequency oscillator Q5 through amplifier Q6. The frequency of Q5 can be set from approximately 452.5 kilohertz to 457.5 kilohertz by positioning the BFO pitch control. The difference frequency between the 455 kilohertz incoming IF signal and the oscillator signal produces a tone (beat frequency) between 0 and 2.5 kilohertz. This audio range signal is fed out to the AM position of the AM-FM switch on the front panel. Operation of the 10.7 Megahertz circuit is almost identical except that the BFO pitch control varies the beat frequency between 0 and 20 kilohertz. The 10.7 Megahertz circuit is activated only on band 7 through 10.

(2) CIRCUIT DESCRIPTION. - The BFO circuit consists of two independent channels which

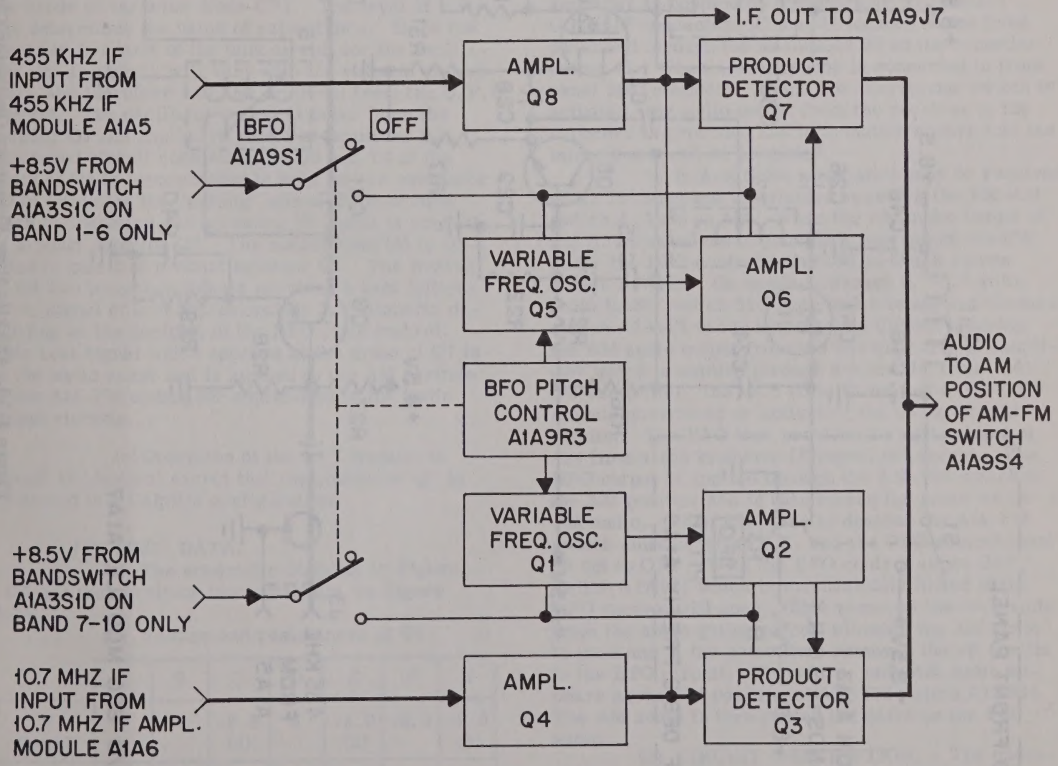

Figure 4-12. Beat Frequency Oscillator Circuit, Block Diagram

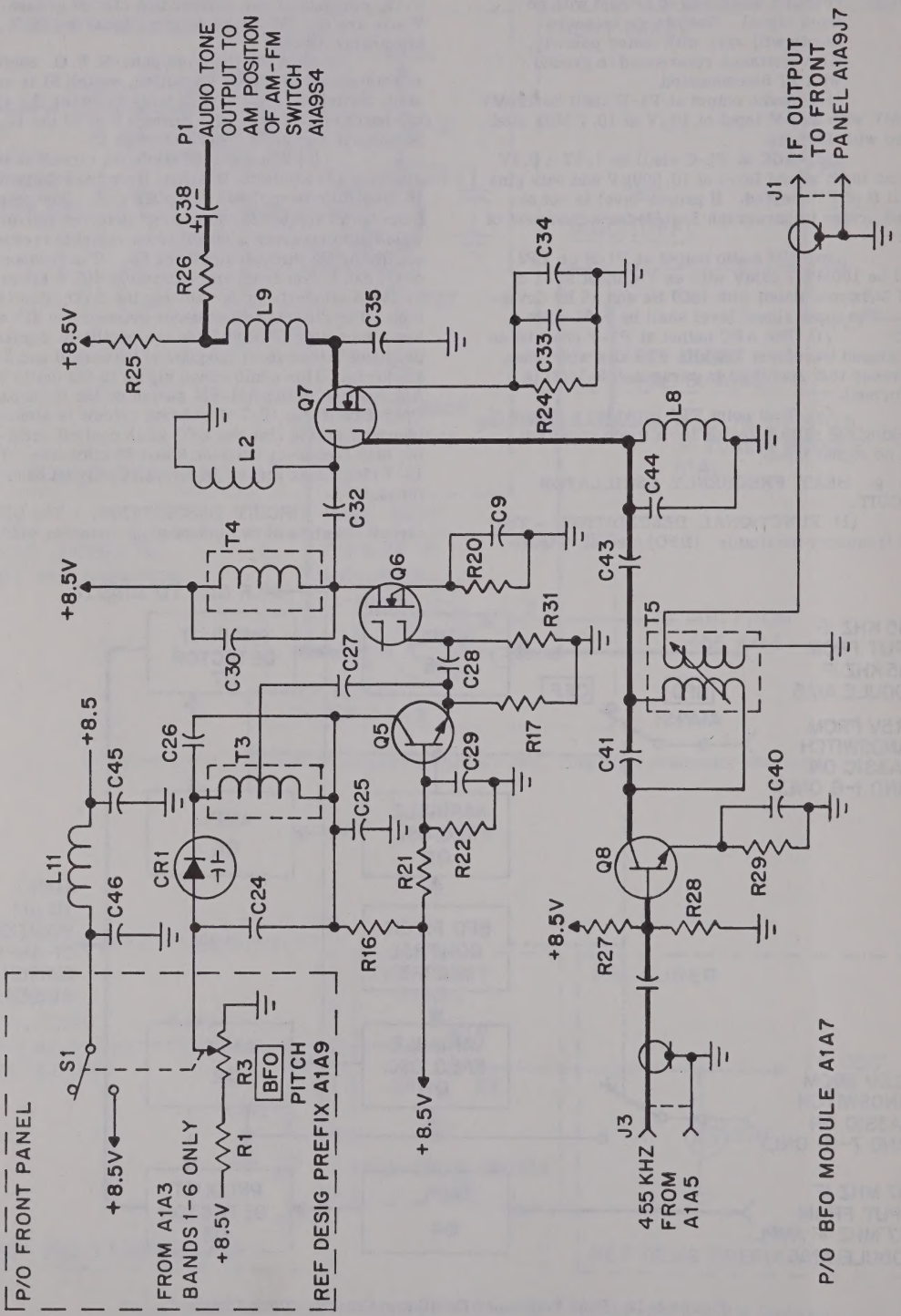

Figure 4-13. 455 kHz Beat Frequency Oscillator Circuit, Simplified Schematic Diagram

function almost identically. These are a 455 kilohertz circuit used on bands 1 through 6 and a 10.7 Megahertz circuit used on bands 7 through 10. Because of the similarity of operation only the 455 kilohertz circuit will be discussed in detail.

(a) The 455 kilohertz IF signal from the 455 kilohertz IF amplifier module A1A5 is applied through J3, Figure 4-13, to the base of the amplifier Q8, whenever bands 1 through 6 are in operation. The collector of Q8 is tuned to 455 kilohertz by transformer T5 in conjunction with capacitor C41. The 455 kilohertz signal from the primary of T5 is applied to gate 1 of product detector Q7, which is a dual gate field effect transistor. The secondary of T5 is used to supply an IF output to the front panel IF output connector A1A9J7 for use with direction-finding equipment.

(b) The product detector, Q7, oscillator stage, Q5, and amplifier state, Q6, receive operating voltage of +8.5 volts through B.F.O. control switch A1A9S1 when the BFO control is rotated out of the OFF position. Oscillator Q5 is connected in a Hartley configuration. The application of +8.5 volts to oscillator Q5 causes the oscillator to produce an output frequency between approximately 452 and 458 kilohertz depending on the position of BFO pitch control A1A9R23. The positioning of the BFO control applies a dc level between 0 and +3.5 volts to the anode of varactor diode CR1. The level of voltage determines the value of capacitance. Since the varactor is a part of the tank circuit for the oscillator, the frequency will vary with the value of capacitance and therefore with the dc level from the B.F.O. control. The oscillator output is taken from the emitter Q5 and applied to gate 1 of amplifier Q6. The tuned circuit consisting of C30 and T4 at the drain of Q6 is incorporated to help isolate oscillator Q5 to minimize the "pulling" effect which occurs when an incoming 455 kilohertz IF signal is present at product detector Q7. The output from Q6 is applied to gate 2 of product detector Q7. The mixing of the two incoming signals provides a beat (difference) signal of 0 to approximately 2.5 kilohertz depending on the position of the BFO pitch control. This beat signal which appears at the drain of Q7 is in the audio range and is applied to the AM position of the AM-FM switch for application to the audio output circuits.

(c) Operation of the 10.7 Megahertz circuit is identical except that the oscillator Q1 is connected in a Colpitts configuration.

(3) TEST DATA.

(a) The schematic diagram is Figure 5-37 and the servicing block diagram is Figure 4-26.

(b) Voltage and resistances at P1

	A	B	C	D	E	F	H
V (Note)	0	–	+2.2 (4)	0	+8.0 (3)	+8.0	+8.0 (3)
R	250K	–	9200	0	320	27K	740

Note:
1. Voltages measured to ground with no input signal.
2. All resistance are reference to ground with P1 disconnected.
3. P1-E voltage present on bands 7 through 10 only. P1-H voltage present on bands 1 through 6 only.
4. Voltage level depends on front panel B. F. O. control position
5. BFO control A1A9R3 maximum clockwise.

(c) IF output at J2 is 455 kHz on bands 1 through 6 and 10.7 MHz on bands 7 through 10.

h. AUDIO CIRCUIT.

(1) FUNCTIONAL ANALYSIS. - The audio circuit receives either amplitude modulation (AM) or frequency modulation (FM) audio input. The FM audio is obtained from the 10.7 Megahertz IF amplifier module. The AM audio input may be obtained from any one of three sources. These are the 455 kilohertz IF amplifier module, the 10.7 Megahertz IF amplifier module or the BFO module.

(a) When FM audio is desired (available on bands 7 through 10 only), the FM-AM switch A1A9S4, Figure 4-14, is set to FM. This routes the FM audio signal to the VOL control A1A9R4. The audio output is taken from the VOL control and amplified by Q1 and Q2. Audio driver Q2 drives a pair of push-pull amplifier Q3 and Q4. The output of the push-pull amplifier is coupled by transformer T1 to audio OUTPUT connectors J3 and J4 located on the front panel and through the attenuator R9 to the recorder output J1. When a microphone is connected to front panel MIC connector J2 and the microphone switch is actuated, the audio output from the receiver to the recorder is grounded and information spoken into the microphone will be recorded.

(b) Amplitude modulation may be received on all 10 bands and is selected by setting the FM-AM switch A1A9S4 to AM. When the AM audio output of the BFO is desired to provide a tone output for CW code, the BFO control is turned on which closes switch A1A9S1. On bands 1 through 6, +8.5 volts from BAND switch S1C rear wafer is applied through switch A1A9S1 to the audio gating circuit blocking the AM audio output from the 455 kilohertz IF amplifier which is applied through switch S1C front. At the same time, the +8.5 volts is applied to the BFO module energizing or activating the 455 kilohertz section. The BFO then provides an audio output at any time a 455 kilohertz IF signal is present. The BFO output is applied through the AM-FM switch in the AM position and is then routed the same as for FM audio. When AM audio is desired the AM-FM switch must be set to AM, and the BFO control must be set to OFF. With the BFO control set to OFF, switch A1A9S1 which is mechanically linked to the BFO control will open. This removes the +8.5 volts from the audio gating circuit allowing the AM audio to pass and at the same time removes the +8.5 volts to the BFO circuit. Therefore, only AM audio appears at the AM position of AM-FM switch A1A9S4. The AM audio is then routed the same as the FM audio.

(2) CIRCUIT DESCRIPTION. - The operation was described of the switching circuits and the audio gating-circuit in paragraph c(1) above. The

description here will start with the inputs to the AM-FM switch and describe the audio module and front panel connectors. When FM audio is required, the AM-FM switch A1A9S4, Figure 4-15, is set to FM. The FM audio output from the 10.7 Megahertz IF amplifier module A1A6 is routed through switch A1A9S4 and applied across volume control R4. A porfion of the audio signal selected by the wiper arm of the volume control is applied to the base of audio amplifier Q1. The output at the collector of Q1 is applied to the base of Q2. Capacitors C2 and C3 and resistors R5 and R6 form a tone control circuit with C2 limiting the low frequency response and C3 limiting the high frequency response. The overall audio bandpass is set for not more than 6 db variation between 300 Hz and 3000 Hz. The output from driver Q2 is applied to the primary of push-pull transformer T1. The secondary of A1T1 drives push-pull amplifiers Q3 and Q4 whose output is applied to the primary of output transformer A1T1 located on the main chassis. Resistors R10 and R13 set the bias of Q3 and Q4 for class AB operation. Capacitors C5 and C6 provide damping to prevent parasitic oscillation. The output from the secondary of T1 on the main chassis is supplied to the headset OUTPUT connectors J3 and J4, and as negative feedback through resistor R16 to audio driver stage Q2. The front panel resistor R9 serves two functions, first it provides attenuation to the audio signal applied to the recorder from the output transformer to prevent overloading the recorder input, and second when the microphone is used, it acts as the load for the microphone.

(a) When AM operation is selected by setting the AM-FM switch to AM, audio may be obtained from the envelope detectors in either the 455 kilohertz IF amplifier module or the 10.7 Megahertz IF amplifier module, or from the BFO module. The AM audio output from the 455 kilohertz module is available on band 1 through 6 only as described in paragraph c(1) above. The AM audio output from the 10.7 Megahertz IF amplifier module is available on bands 7 through 10 as described in c(1) above. The audio output from the product detectors in the BFO module is available on all bands but only if the BFO control is rotated out of the OFF position as described in g(1) above.

(3) TEST DATA.

(a) Refer to Figure 5-38 for schematic of the audio module and to Figure 4-28 for the Servicing Block Diagram.

(b) Voltages and resistances at connectors P1 and P2.

P1							
	A	B	C	D	E	F	H
V	0	0	–	+1.2 to +2.3	+0.8	+8.0	+0.8
R (Note)	300K (3)	0	–	28K	200K (3)	8	2200 (4)

P2							
	A	B	C	D	E	F	H
V	+12	0	+12	0	+8	+12	–
R (Note)	6000 (4)	2000 (4)	8	0	7000 (4)	3400 (4)	–

Note: 1. Voltages measured to ground with no input signal.
2. Resistance measurements will vary with meter polarity. All resistances referenced to ground with P1 and P2 disconnected.
3. Ohmmeter set to R x 100k range.
4. Ohmmeter set to R x 1k range.

i. FREQUENCY CALIBRATION.

(1) FUNCTIONAL DESCRIPTION. - The frequency calibrator circuit is energized by the front panel meter switch and provides a 100 kilohertz or a 1 Megahertz calibrator output.

(a) When METER switch A1A9S3, Figure 4-16, is set to the 0.1 MHZ position, the 100 kilohertz oscillator Q5, is energized. The 100 kilohertz fundamental is amplified by Q6 and used to actuate a Schmitt trigger that generates a large number of harmonics which are passed by emitter follower Q4 to the EXT antenna input connector for application to the tuner module A1A1.

(b) The 0.1 Megahertz oscillator, Q1, is energized when the METER switch on the front panel is set to the 1.0 MHZ position. The output of Q2 controls the Schmitt trigger which operates in the same way as for the 100 kilohertz outputs except that harmonics of 1.0 Megahertz are developed which are routed to the tuner module.

(2) CIRCUIT DESCRIPTION. - The 100 kilohertz oscillator, Figure 4-17, is energized by placing the meter switch A1A9S3 located on the front panel to the CAL 0.1 MHz position. This supplies +8.5 vdc volts through contacts 3 and 7 of S3 front and resistor R18 to the collector of oscillator Q5, energizing Q5. Oscillator Q5 provides a fundamental 100 kilohertz output which is coupled from the base of Q5 to the base of amplifier Q6.

(a) Base to base coupling is used to reduce loading of crystal Y2 and thus improve waveshape and stability. The 100 kilohertz signal is then applied to the Schmitt trigger circuit Q2 and Q3, which provides the fast rise time required to produce an abundance of harmonics. The output of the Schmitt trigger is applied to emitter follower Q4. Diode CR1 and CR2 allow Q4 to be switched off on the negative excursion of the Schmitt trigger output. This results in an improved waveshape for harmonic generation while still maintaining a low impedance output. The output signal consisting of a 100 kilohertz fundamental plus a large number of harmonics is routed out to the tuner assembly where it can be inserted into the RF circuit.

(3) TEST DATA.

(a) Refer to Figure 5-32 for module schematic diagram and Figure 4-29 for the servicing block diagram.

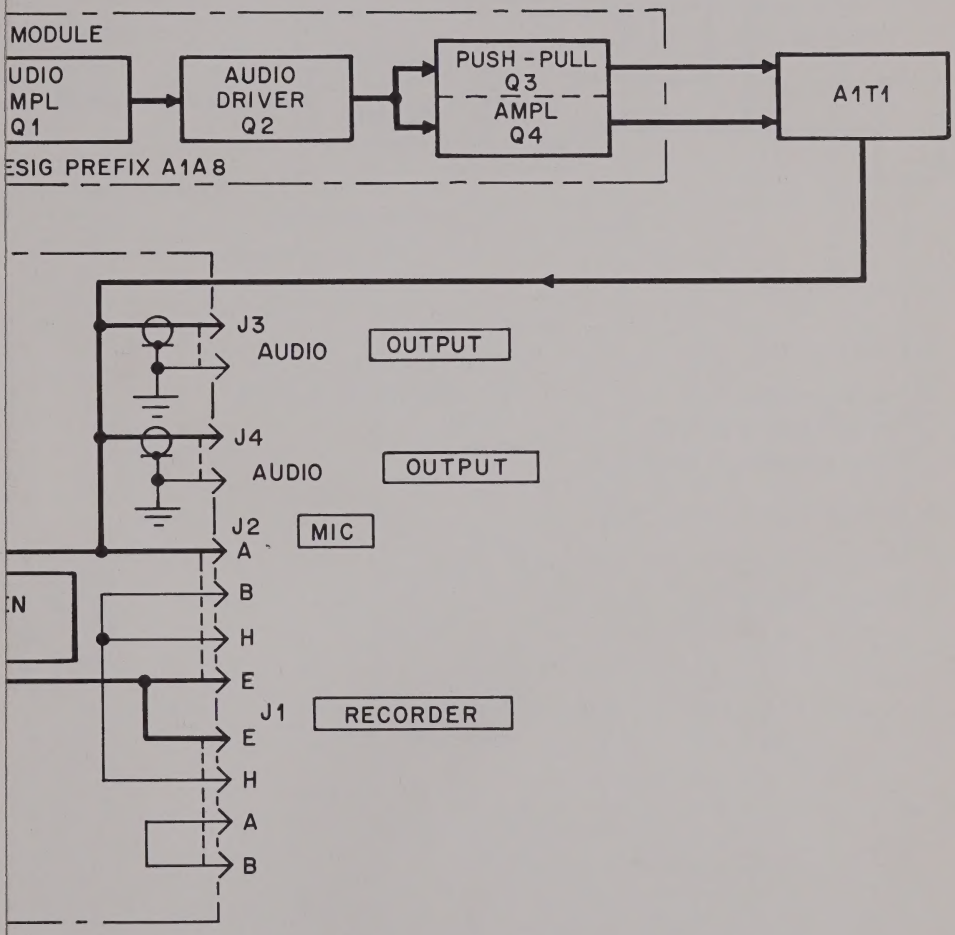

Figure 4-14. Audio Circuit, Block Diagram

description here will start with the inputs to the AM-FM switch and describe the audio module and front panel connectors. When FM audio is required, the AM-FM switch A1A9S4, Figure 4-15, is set to FM. The FM audio output from the 10.7 Megahertz IF amplifier module A1A6 is routed through switch A1A9S4 and applied across volume control R4. A portion of the audio signal selected by the wiper arm of the volume control is applied to the base of audio amplifier Q1. The output at the collector of Q1 is applied to the base of Q2. Capacitors C2 and C3 and resistors R5 and R6 form a tone control circuit with C2 limiting the low frequency response and C3 limiting the high frequency response. The overall audio bandpass is set for not more than 6 db variation between 300 Hz and 3000 Hz. The output from driver Q2 is applied to the primary of push-pull transformer T1. The secondary of A1T1 drives push-pull amplifiers Q3 and Q4 whose output is applied to the primary of output transformer A1T1 located on the main chassis. Resistors R10 and R13 set the bias of Q3 and Q4 for class AB operation. Capacitors C5 and C6 provide damping to prevent parasitic oscillation. The output from the secondary of T1 on the main chassis is supplied to the headset OUTPUT connectors J3 and J4, and as negative feedback through resistor R16 to audio driver stage Q2. The front panel resistor R9 serves two functions, first it provides attenuation to the audio signal applied to the recorder from the output transformer to prevent overloading the recorder input, and second when the microphone is used, it acts as the load for the microphone.

(a) When AM operation is selected by setting the AM-FM switch to AM, audio may be obtained from the envelope detectors in either the 455 kilohertz IF amplifier module or the 10.7 Megahertz IF amplifier module, or from the BFO module. The AM audio output from the 455 kilohertz module is available on band 1 through 6 only as described in paragraph c(1) above. The AM audio output from the 10.7 Megahertz IF amplifier module is available on bands 7 through 10 as described in c(1) above. The audio output from the product detectors in the BFO module is available on all bands but only if the BFO control is rotated out of the OFF position as described in g(1) above.

(3) TEST DATA.

(a) Refer to Figure 5-38 for schematic of the audio module and to Figure 4-28 for the Servicing Block Diagram.

(b) Voltages and resistances at connectors P1 and P2.

P1							
	A	B	C	D	E	F	H
V	0	0	–	+1.2 to +2.3	+0.8	+8.0	+0.8
R (Note)	300K (3)	0	–	28K	200K (3)	8	2200 (4)

P2							
	A	B	C	D	E	F	H
V	+12	0	+12	0	+8	+12	–
R (Note)	6000 (4)	2000 (4)	8	0	7000 (4)	3400 (4)	–

Note: 1. Voltages measured to ground with no input signal.
2. Resistance measurements will vary with meter polarity. All resistances referenced to ground with P1 and P2 disconnected.
3. Ohmmeter set to R x 100k range.
4. Ohmmeter set to R x 1k range.

i. FREQUENCY CALIBRATION.

(1) FUNCTIONAL DESCRIPTION. - The frequency calibrator circuit is energized by the front panel meter switch and provides a 100 kilohertz or a 1 Megahertz calibrator output.

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(b) The 0.1 Megahertz oscillator, Q1, is energized when the METER switch on the front panel is set to the 1.0 MHZ position. The output of Q2 controls the Schmitt trigger which operates in the same way as for the 100 kilohertz outputs except that harmonics of 1.0 Megahertz are developed which are routed to the tuner module.

(2) CIRCUIT DESCRIPTION. - The 100 kilohertz oscillator, Figure 4-17, is energized by placing the meter switch A1A9S3 located on the front panel to the CAL 0.1 MHz position. This supplies +8.5 vdc volts through contacts 3 and 7 of S3 front and resistor R18 to the collector of oscillator Q5, energizing Q5. Oscillator Q5 provides a fundamental 100 kilohertz output which is coupled from the base of Q5 to the base of amplifier Q6.

(a) Base to base coupling is used to reduce loading of crystal Y2 and thus improve waveshape and stability. The 100 kilohertz signal is then applied to the Schmitt trigger circuit Q2 and Q3, which provides the fast rise time required to produce an abundance of harmonics. The output of the Schmitt trigger is applied to emitter follower Q4. Diode CR1 and CR2 allow Q4 to be switched off on the negative excursion of the Schmitt trigger output. This results in an improved waveshape for harmonic generation while still maintaining a low impedance output. The output signal consisting of a 100 kilohertz fundamental plus a large number of harmonics is routed out to the tuner assembly where it can be inserted into the RF circuit.

(3) TEST DATA.

(a) Refer to Figure 5-32 for module schematic diagram and Figure 4-29 for the servicing block diagram.

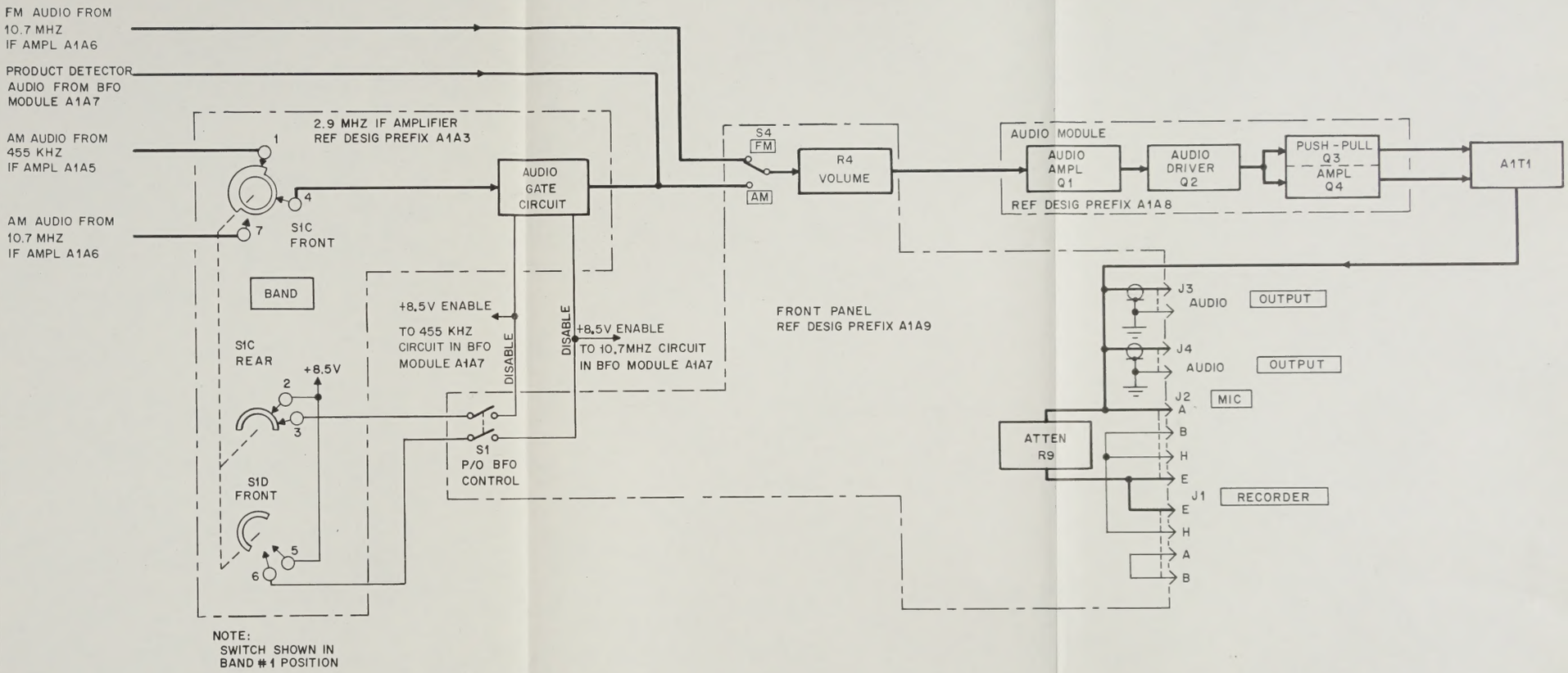


Figure 4-14. Audio Circuit, Block Diagram

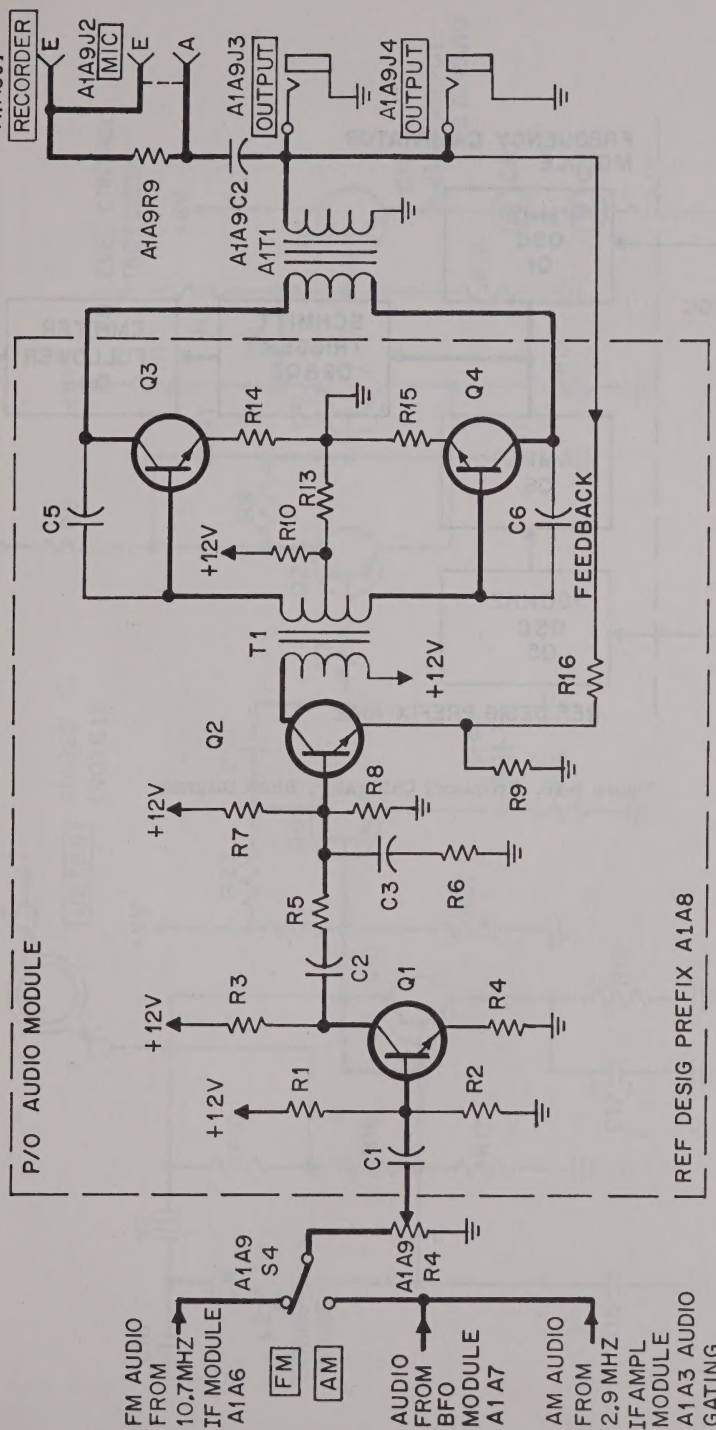


Figure 4-15. Audio Circuit, Simplified Schematic Diagram

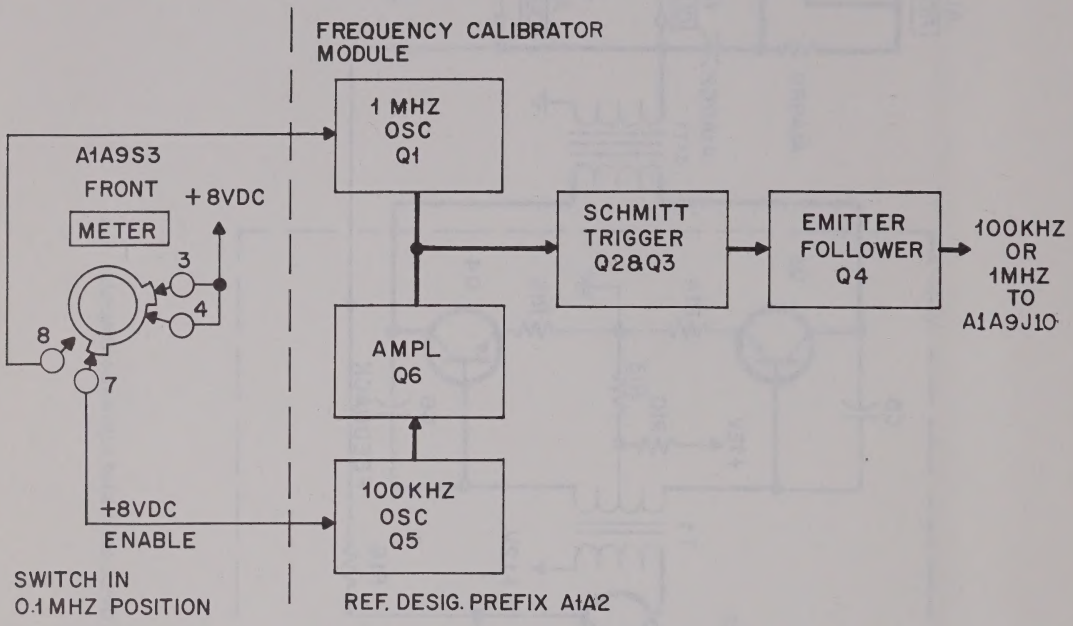


Figure 4-16. Frequency Calibrator, Block Diagram

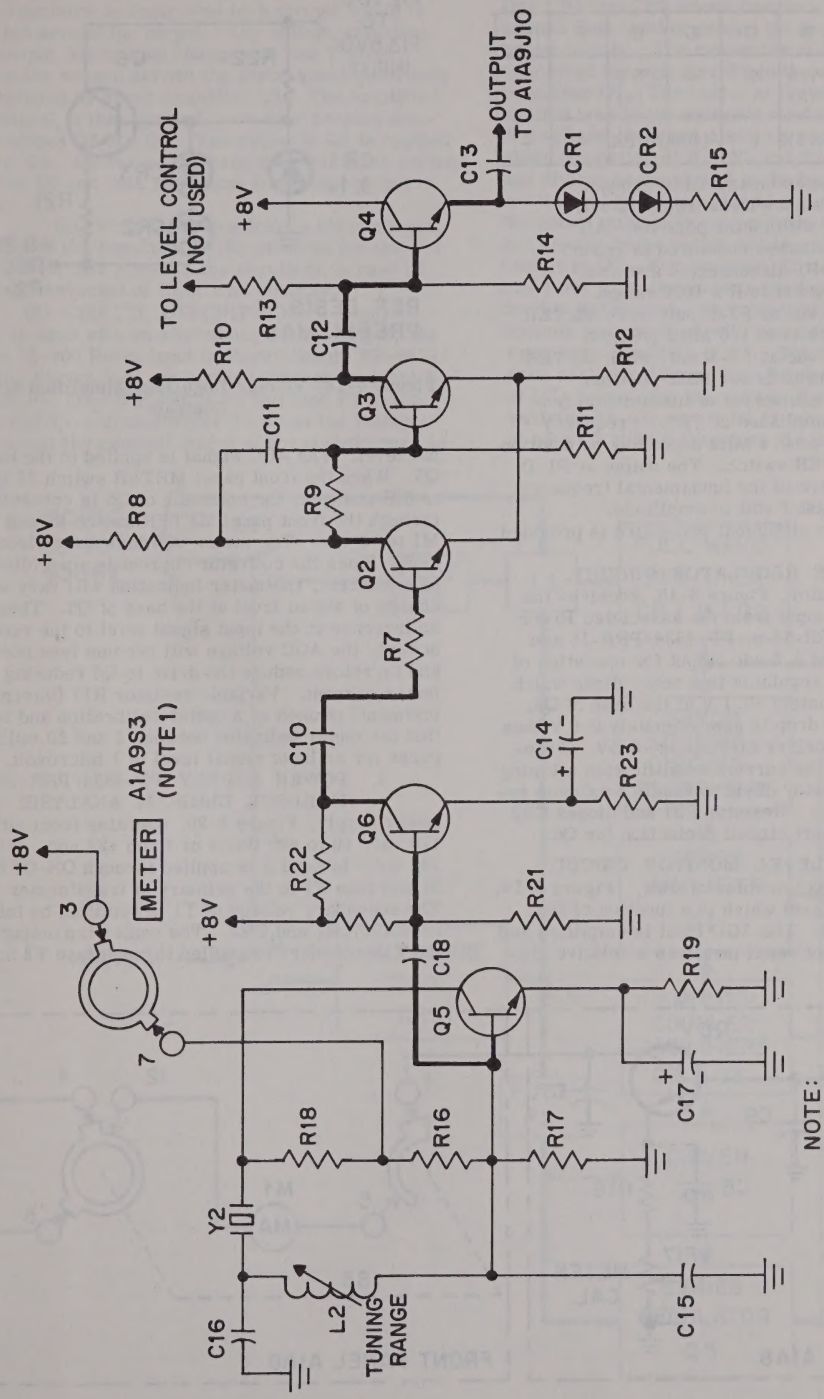


Figure 4-17. 100 kHz Frequency Calibrator, Simplified Schematic Diagram

(b) Voltage and resistance at P1.

	A	B	C	D	E	F	H
V (Note)	0	+7.6 (3)	0	–	+7.6 (4)	–	–
R	0	10.5K	0	4400	10.5K	–	–

Note: 1. Voltages measured to ground.
2. Resistance measurements will vary with meter polarity. All resistances measured to ground with P1 disconnected and ohmmeter set to R x 1000 range.
3. +8.5 vdc at P1-B only when METER switch is in 1.0 MHZ position.
4. +8.5 vdc at P1-E only when METER switch is in 0.1 MHZ position.

(c) Measurement of fundamental frequency can be accomplished at TP1. Frequency should be 1.0 MHz or 0.1 MHz depending on position of front panel METER switch. The output at P1-D will be a square wave of the fundamental frequency and should be at least 1 volt in amplitude.

(d) The alignment procedure is provided in paragraph 5-3h.

j. VOLTAGE REGULATOR CIRCUIT.

The dc regulator, Figure 4-18, receives the 12 vdc to 13.5 vdc input from the associated Power Supply PP-4833/PRR-15 or PP-4834/PRR-15 and provides a regulated 8.5 vdc output for operation of the receiver. The regulator is a zener diode which maintains approximately +9.1 V at the base of Q6, the base to emitter drop is approximately 0.6 V thus the output to the receiver circuits is +8.5V. Transistor Q6 provides the current amplification allowing a low current regulator diode to handle maximum receiver load demands. Resistor R21 and diodes CR2 and CR3 provide short circuit protection for Q6.

k. SIGNAL LEVEL MONITOR CIRCUIT.

The signal level monitor circuit, Figure 4-19, monitors the AGC level which is a function of incoming signal level. The AGC level is amplified and indicated on the front panel meter as a relative signal level. The AGC signal is applied to the base of Q5. When the front panel METER switch S3 is set to SIG position, the collector of Q5 is connected through the front panel METER switch S3 and meter M1 to +8 vdc. The meter will indicate collector current. Since the collector current is controlled by the base current, the meter indication will vary with a change of signal level at the base of Q5. Thus, when an increase in the input signal level to the receiver occurs, the AGC voltage will become less positive and therefore reduce the drive to Q5 reducing collector current. Variable resistor R17 (internal adjustment) is used as a meter calibration and is set so that the meter indicates between 5 and 10 milliamperes for an input signal level of 1 microvolt.

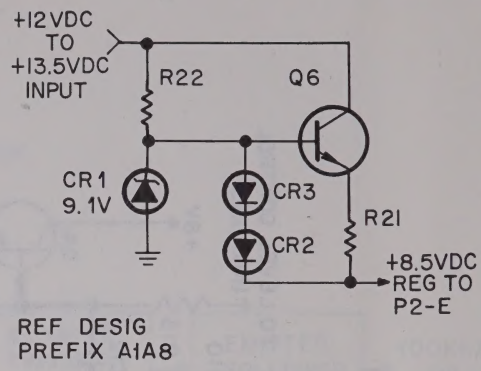


Figure 4-18. Voltage Regulator, Simplified Schematic Diagram

1. POWER SUPPLY PP-4834/PRR-15.

(1) BLOCK DIAGRAM ANALYSIS. - The power supply, Figure 4-20, operates from either 120 vac, 50 to 400 Hertz or from +24 vdc. When 120 volts is used it is applied through ON-OFF switch S1 and fuse F1 to the primary of transformer T1. The secondary voltage of T1 is rectified by full wave rectifier CR1 and CR2. The center tap output from the T1 secondary is applied through fuse F2 and

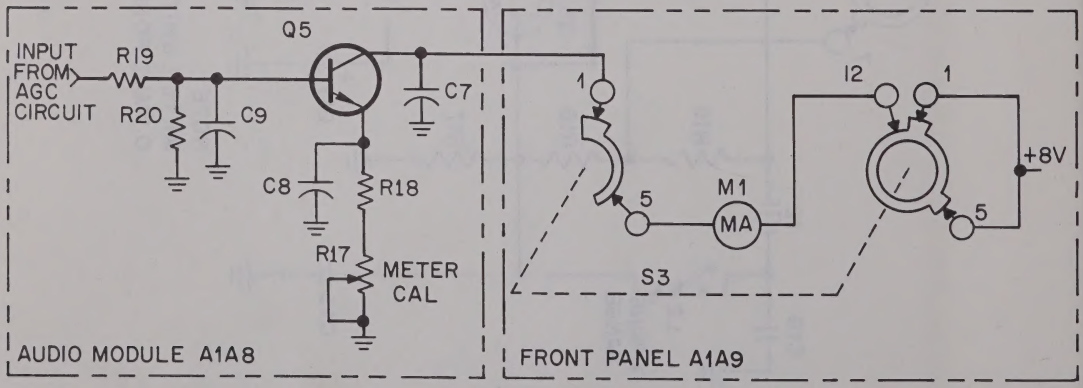


Figure 4-19. "S" Meter, Simplified Schematic Diagram

series regulator Q5 to the output connector. The series regulator is controlled by a circuit which is connected across the output. Any voltage variation in the output due to load changes or line voltage changes are sensed across the error sensing network and amplified by error amplifier Q1. The amplified error signal is then applied to emitter coupled amplifier stages Q2 and Q3. The output of Q3 is applied to drive Q4. Q4 varies the base current of the series regulator Q5 and thus maintains a constant output voltage.

(a) When operating from a +24 vdc input, operation of the regulator is the same as for the a-c input. Diode CR3 protects the regulator in case of accidental reversal of input lead polarity.

(2) CIRCUIT DESCRIPTION. - When the circuit is used with an alternating current input, the 120 vac 50-400 Hertz input to Power Supply PP-4834/PRR-15, Figure 5-41, is applied through contacts B and D of P1, ON-OFF switch S1 and fuse F1 to the primary of T1. Transformer T1 steps the voltage down so that the nominal output of the transformer is 24 volts. This voltage is applied to full wave rectifier CR1 and CR2 whose anodes are connected to ground thus making ground the negative side of the power supply. The center tap of T1 secondary is connected through fuse F2 to the emitter of series regulator Q5. The output at the collector of Q5 is applied both to the external circuits as the controlled d-c voltage level and also to a resistive voltage divider consisting of R1, R2 and R3. A tap on the voltage divider is connected to the base of Q1 with the emitter of Q1 set at a fixed level with reference to the output voltage by zener diode CR4. Therefore any change in the output voltage will result in a bias change to Q1. For example, if the output voltage rises due to an increase in the input voltage or a reduction in the load, the voltage at the base of Q1 will become less positive with respect to the emitter increasing conduction of Q1. The increase in voltage drop across collector load R6 decreases conduction of Q2, decreasing the voltage drop across emitter resistor R8. Resistor R8 is common to the emitter of both Q2 and Q3 therefore the decrease in voltage

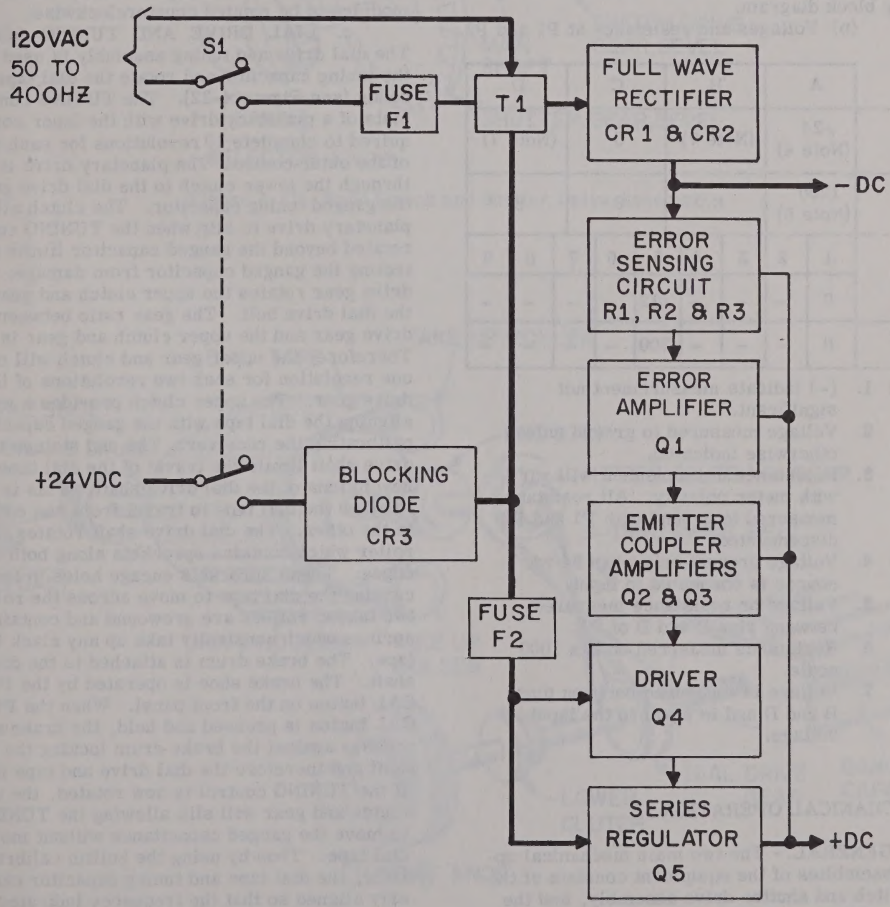


Figure 4-20. Power Supply PP-4834/PRR-15, Block Diagram

drop across R8 increases conductions through Q3 causing an increase in voltage drop across R7. The more positive voltage at the junction of Q3 collector and R7 is applied to the emitter of driver Q4. Driver Q4 conducts less heavily causing a decrease in voltage drop across R13. The decrease in voltage drop across R13 reduces the drive to series regulator Q5 increasing the series impedance thus reducing the output voltage. An indicator lamp DS1 is connected through series resistor R4 across the output to indicate when the power supply is turned on.

(a) When the power supply is operated from 24 vdc, diode CR3 is used to protect the regulator from damage if the input leads from the battery are accidentally reversed. When this occurs diode CR3 is backbiased blocking the input voltage. When the +24 vdc input is properly connected, minus side of battery connected to pin C of P1 and plus sides of battery connected to pin A of P1, the operation of the regulator will be the same as with the 120 vac input.

(3) TEST DATA.

(a) Refer to Figure 5-41 for module schematic diagram and to Figure 4-30 for the servicing block diagram.

(b) Voltages and resistance at P1 and P2.

	A		B		C		D		
V	+24 (Note 4)		(Note 7)		0		(Note 7)		
R	1700 (Note 6)		8		0		8		
	1	2	3	4	5	6	7	8	9
V	0	–	–	–	+12	–	–	–	–
R	0	–	–	–	200	–	–	–	–

Note:
1. (–) indicate measurement not significant.
2. Voltage measured to ground unless otherwise indicated.
3. Resistance measurement will vary with meter polarity. All resistance measured to ground with P1 and P2 disconnected.
4. Voltage present only when 24 vdc source is connected to input.
5. Voltage or resistance measured between pins B and D of P1.
6. Resistance measured on R x 1000 scale.
7. Voltage is measured between pins B and D and is equal to the input voltage.

4-5. MECHANICAL OPERATION.

a. GENERAL. - The two main mechanical operating assemblies of the equipment consists of the BAND switch and shutter drive assembly, and the dial drive and tuning assembly. These assemblies are described in the following paragraphs b and c.

b. BAND SWITCH AND SHUTTER DRIVE ASSEMBLY. - The BAND switch and shutter drive assembly is shown in Figure 4-21. The BAND switch knob on the front panel drives the main shaft on which the shutter drive bevel gear and the switch drive bevel gear are mounted. The shutter drive bevel gear drives the gear attached to the shutter spindle through a gear ratio of 4:1. When the BAND switch knob is rotated to the next higher band, the shutter drive bevel gear rotates clockwise and the driven gear rotates clockwise. This results in the shutter moving from left to right. The takeup shutter spindle maintains torque on the shutter film due to the shutter spring. The torque increases as the shutter film is moved to the right. Thus the take up shutter spindle will cause the shutter film to move to the extreme left when the BAND switch is in the band 1 position. The switch drive bevel gear rotates clockwise when the BAND switch is set to the next higher band position. The switch shaft bevel gear rotates counterclockwise and is attached to the shaft going to the tuner module A1A1 and 2.9 Megahertz IF amplifier module A1A3 causing the wafer switches in the modules to be rotated counterclockwise.

c. DIAL DRIVE AND TUNING ASSEMBLY. - The dial drive and tuning assembly is used to operate the tuning capacitor and rotate the dial tape for all bands (see Figure 4-22). The TUNING control consists of a planetary drive with the inner control required to complete 10 revolutions for each revolution of the outer control. The planetary drive is connected through the lower clutch to the dial drive gear and to the ganged tuning capacitor. The clutch allows the planetary drive to slip when the TUNING control is rotated beyond the ganged capacitor limits thus protecting the ganged capacitor from damage. The dial drive gear rotates the upper clutch and gear through the dial drive belt. The gear ratio between the dial drive gear and the upper clutch and gear is 2:1. Therefore, the upper gear and clutch will complete one revolution for each two revolutions of the dial drive gear. The upper clutch provides a means of aligning the dial tape with the ganged capacitor when calibrating the receiver. The end stop on the dial drive shaft limits the travel of the dial tape to 5-1/2 revolutions of the dial drive shaft. This is sufficient to allow the dial tape to travel from one end of a band to the other. The dial drive shaft rotates the drive roller which contains sprockets along both outer edges. These sprockets engage holes in the dial tape causing the dial tape to move across the roller. The two takeup rollers are prewound and contain internal springs which constantly take up any slack in the dial tape. The brake drum is attached to the dial drive shaft. The brake shoe is operated by the PUSH TO CAL button on the front panel. When the PUSH TO CAL button is pressed and held, the brake shoe presses against the brake drum locking the dial drive shaft and therefore the dial drive and tape in position. If the TUNING control is now rotated, the upper clutch and gear will slip allowing the TUNING control to move the ganged capacitance without moving the dial tape. Thus by using the builtin calibration oscillator, the dial tape and tuning capacitor can be properly aligned so that the frequency indicated on the dial tape corresponds to the frequency of the receiver as determined by the ganged capacitor.

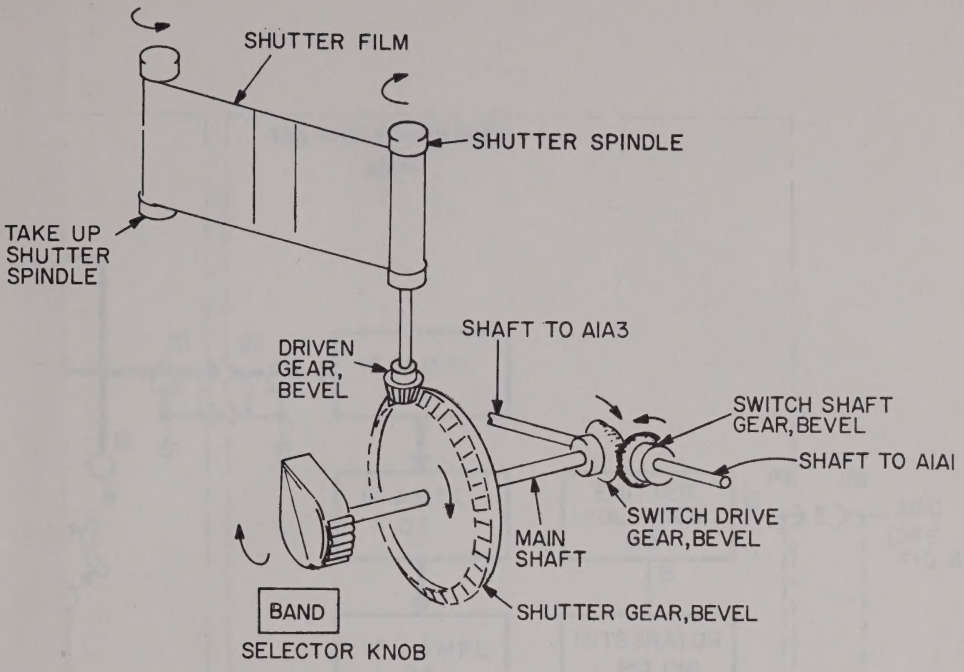


Figure 4-21. Band Switch and Shutter Drive Assembly

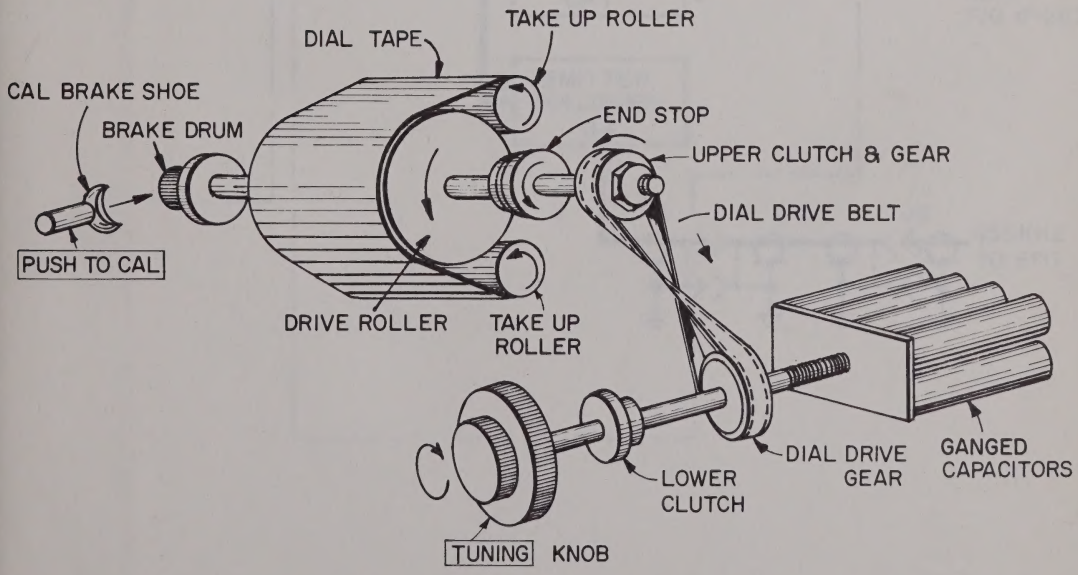
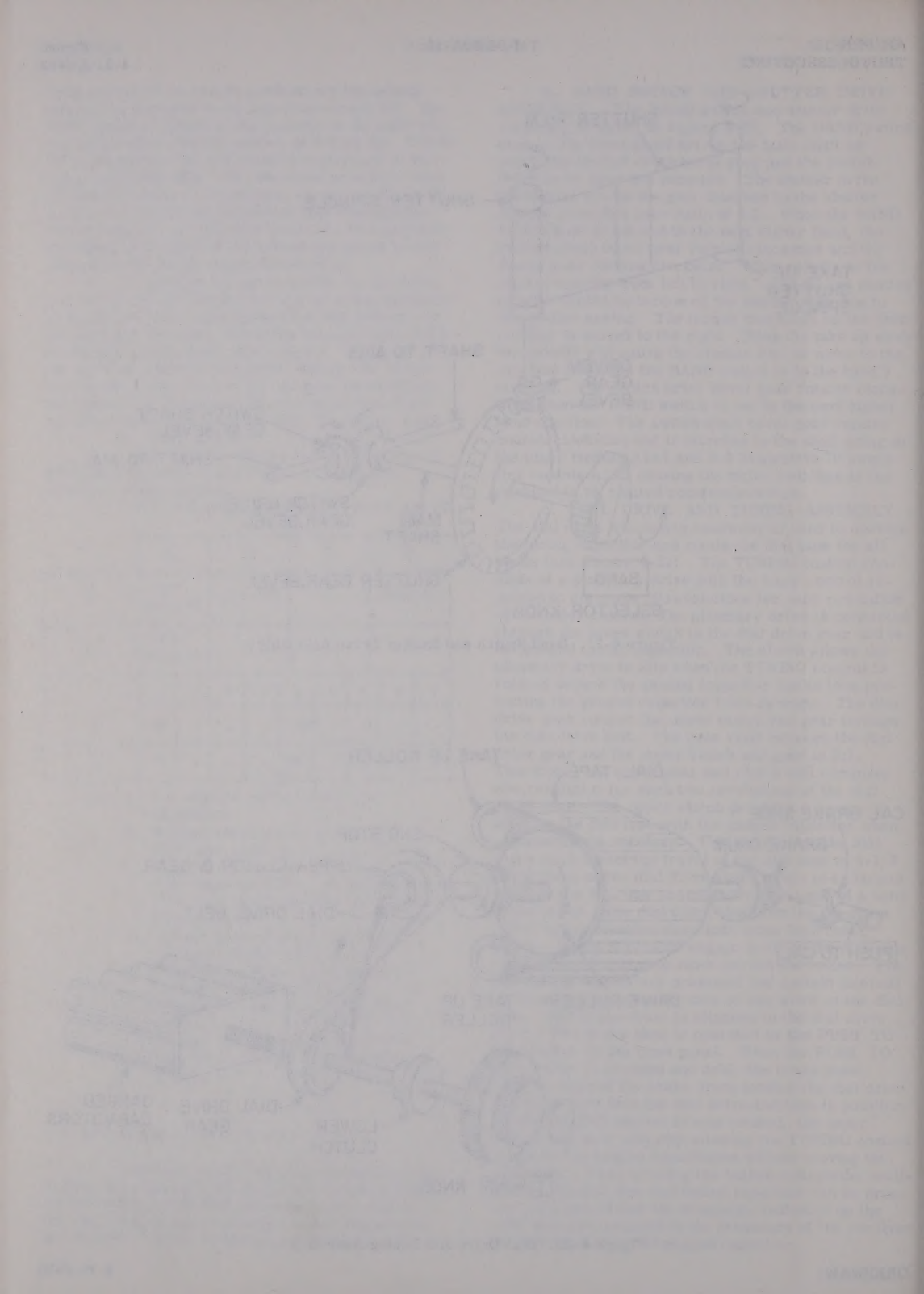


Figure 4-22. Dial Drive and Tuning Assembly



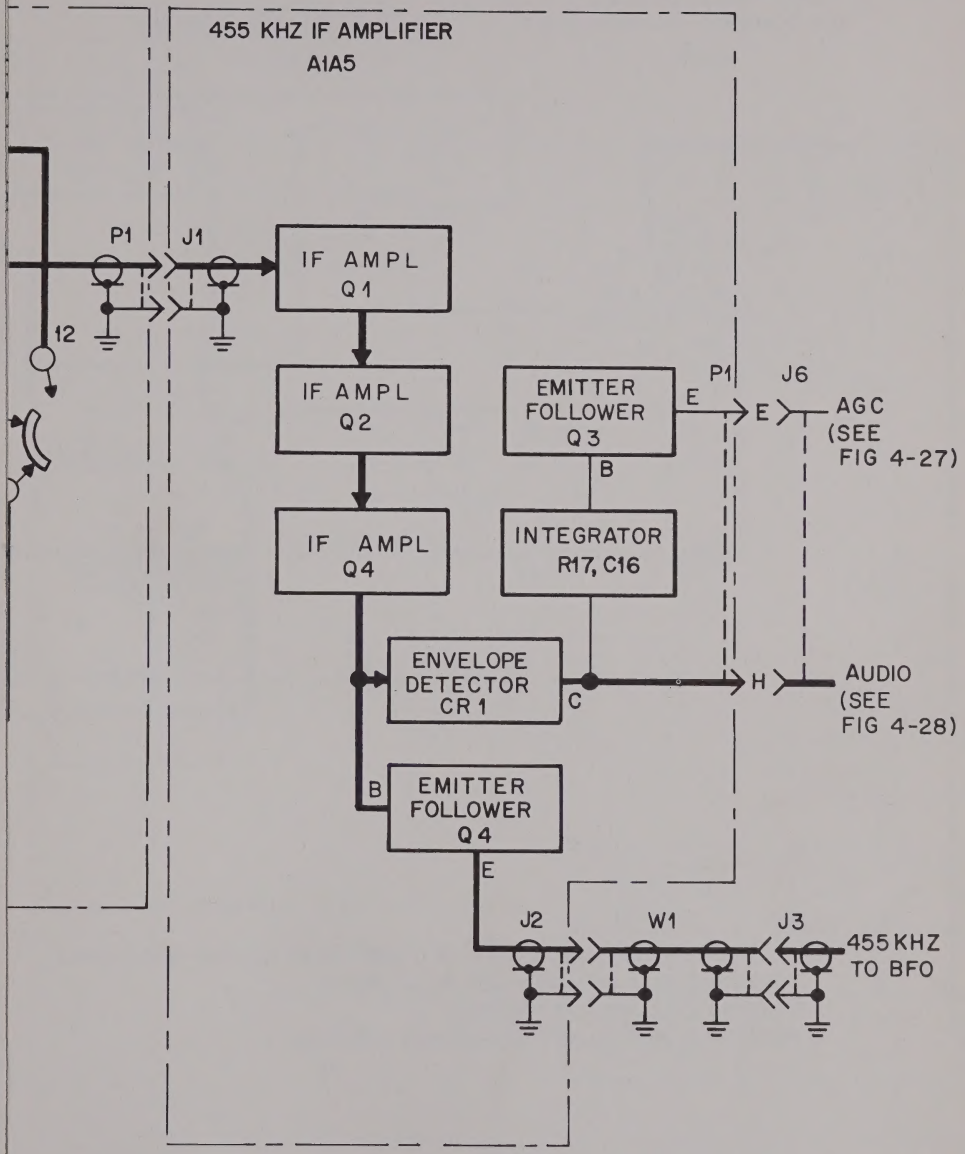
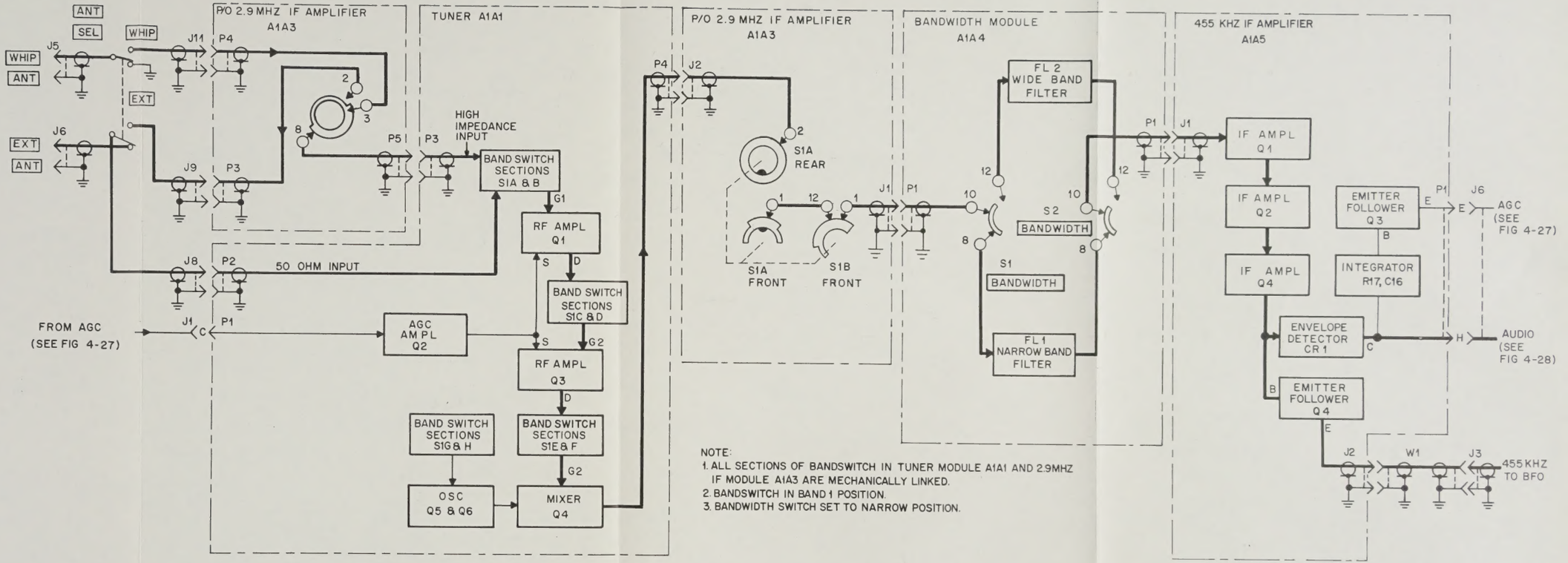
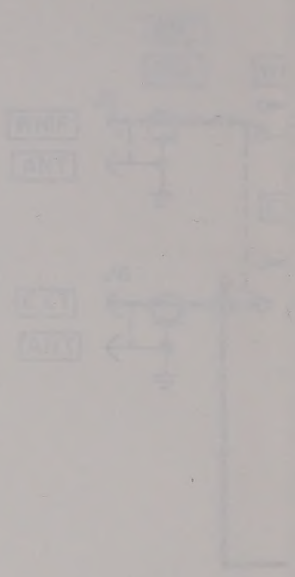


Figure 4-23. Bands 1 to 4, Servicing Block Diagram



NOTE:
1. ALL SECTIONS OF BANDSWITCH IN TUNER MODULE A1A1 AND 2.9MHZ IF MODULE A1A3 ARE MECHANICALLY LINKED.
2. BANDSWITCH IN BAND 1 POSITION.
3. BANDWIDTH SWITCH SET TO NARROW POSITION.

Figure 4-23. Bands 1 to 4, Servicing Block Diagram



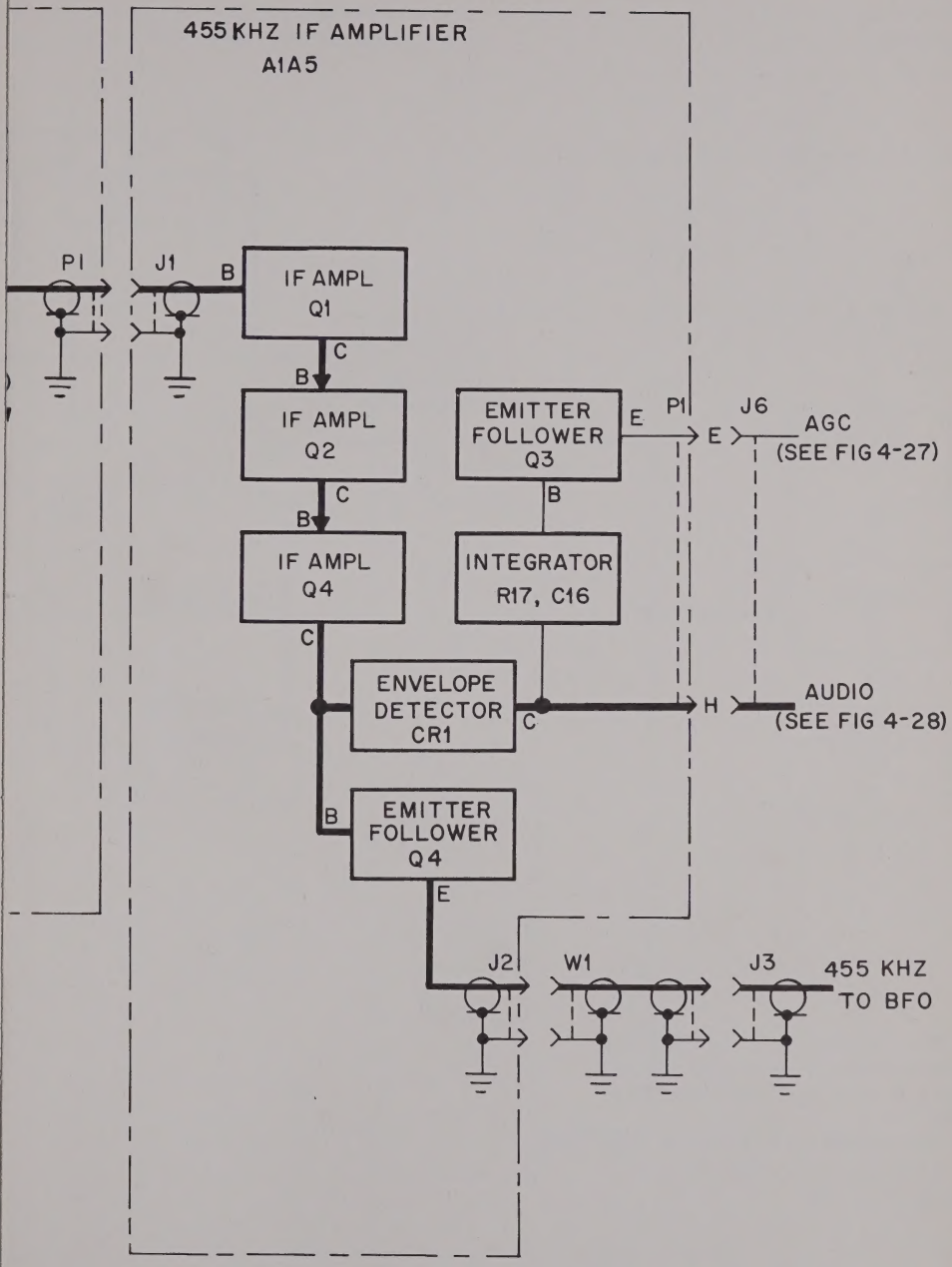
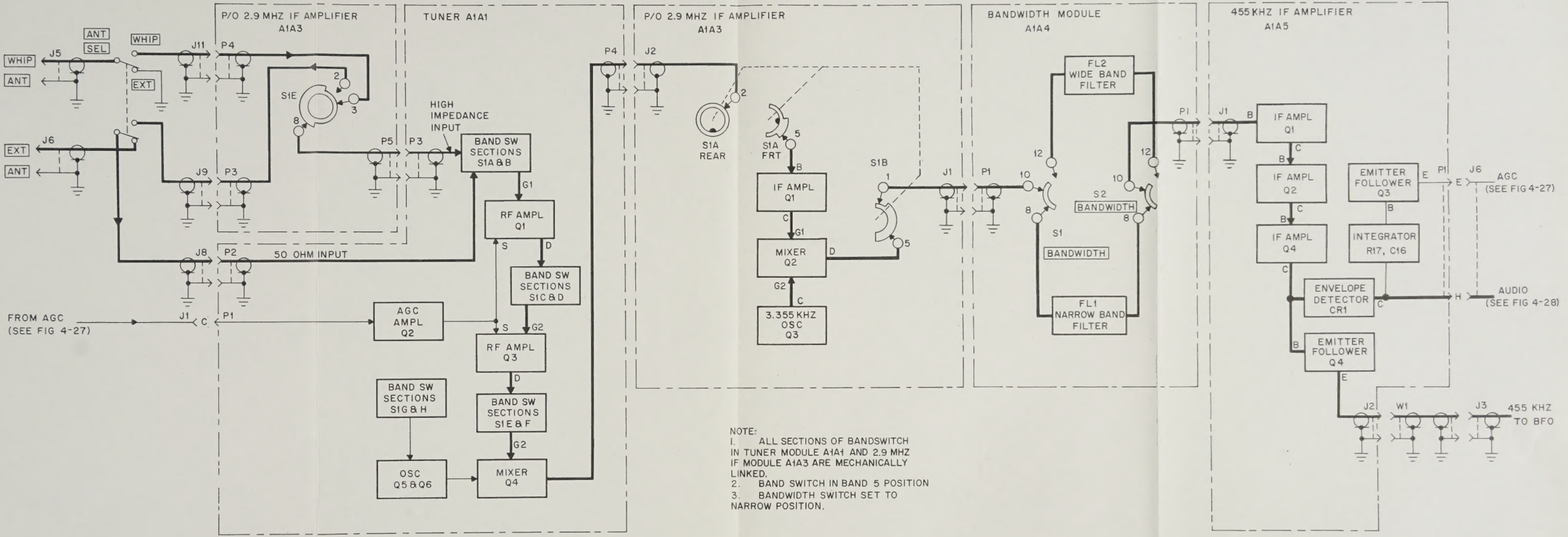


Figure 4-24. Bands 5 and 6, Servicing Block Diagram



NOTE:
1. ALL SECTIONS OF BANDSWITCH IN TUNER MODULE A1A1 AND 2.9 MHZ IF MODULE A1A3 ARE MECHANICALLY LINKED.
2. BAND SWITCH IN BAND 5 POSITION
3. BANDWIDTH SWITCH SET TO NARROW POSITION.

Figure 4-24. Bands 5 and 6, Servicing Block Diagram

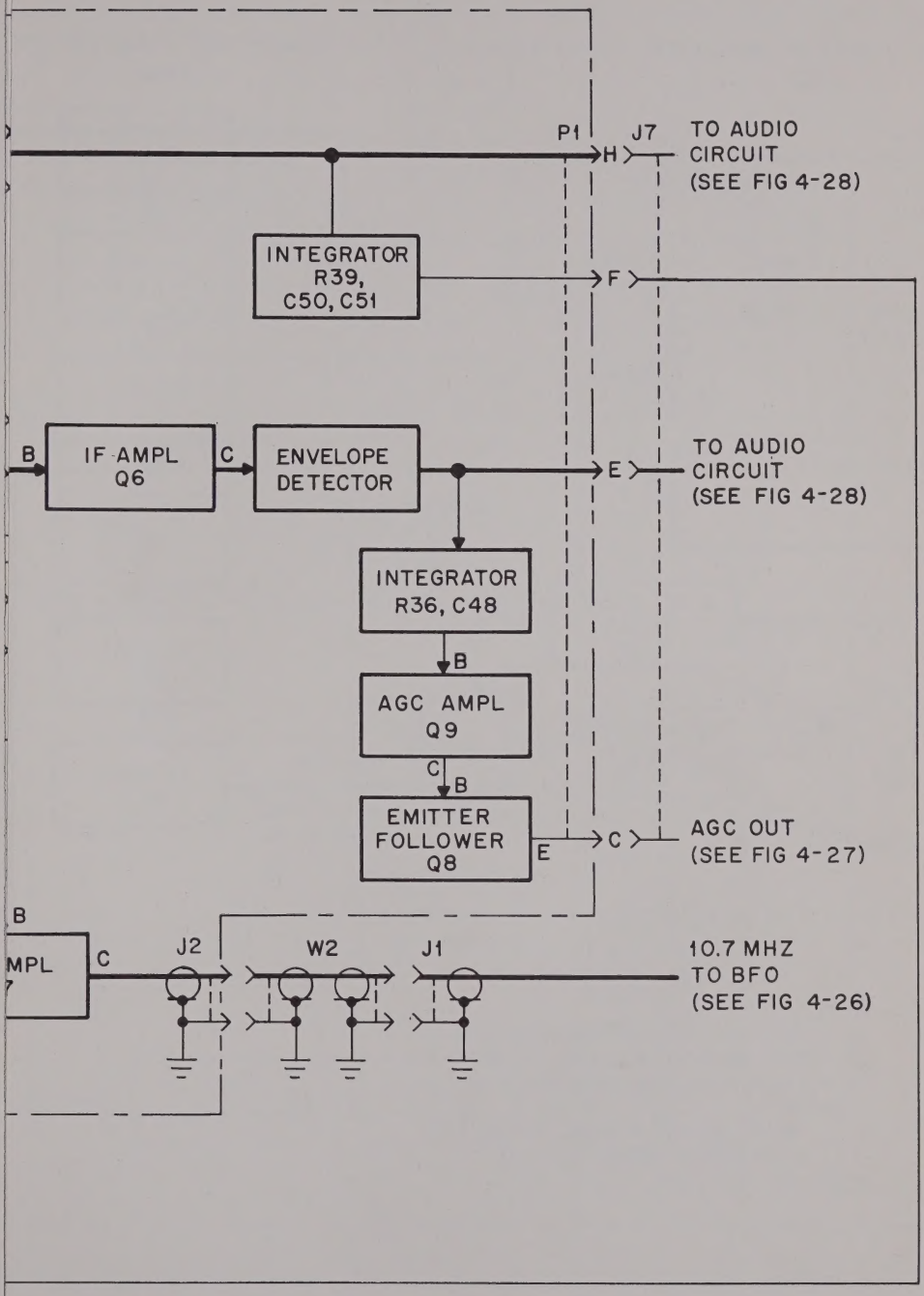
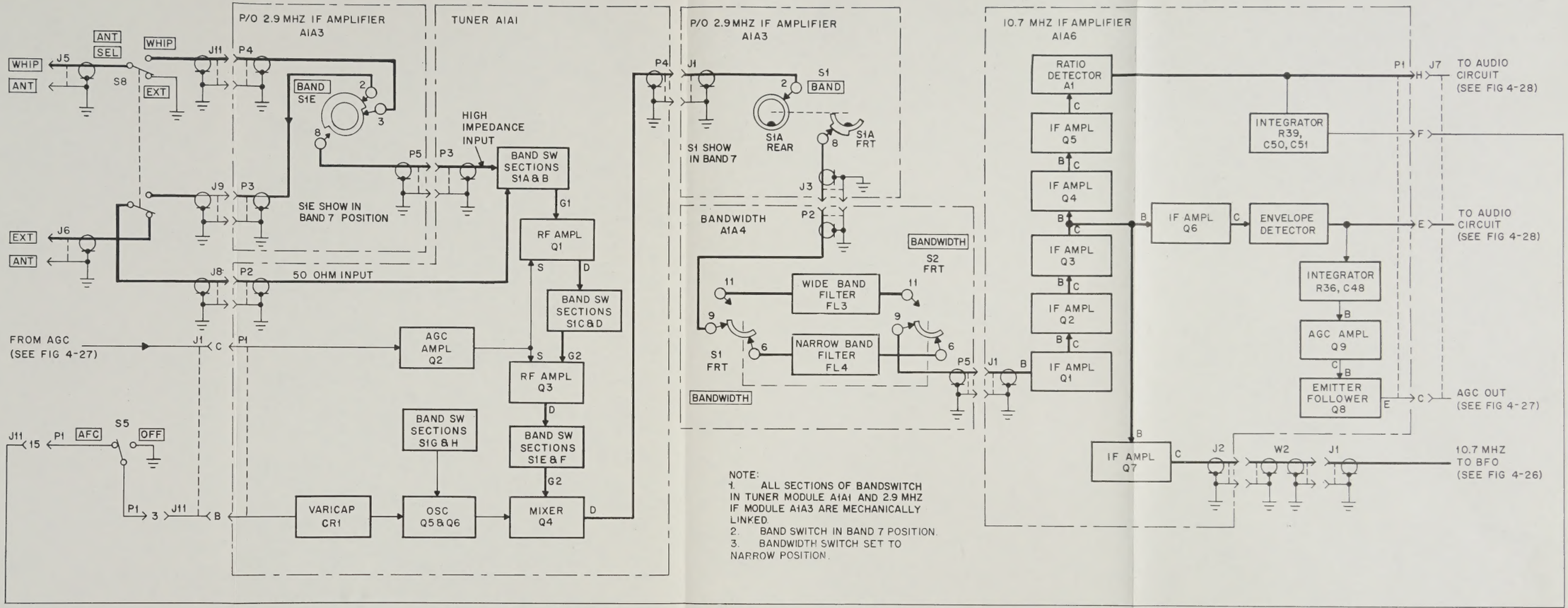


Figure 4-25. Bands 7 to 10, Servicing Block Diagram



NOTE:
1. ALL SECTIONS OF BANDSWITCH IN TUNER MODULE A1A1 AND 2.9 MHZ IF MODULE A1A3 ARE MECHANICALLY LINKED.
2. BAND SWITCH IN BAND 7 POSITION.
3. BANDWIDTH SWITCH SET TO NARROW POSITION.

Figure 4-25. Bands 7 to 10, Servicing Block Diagram

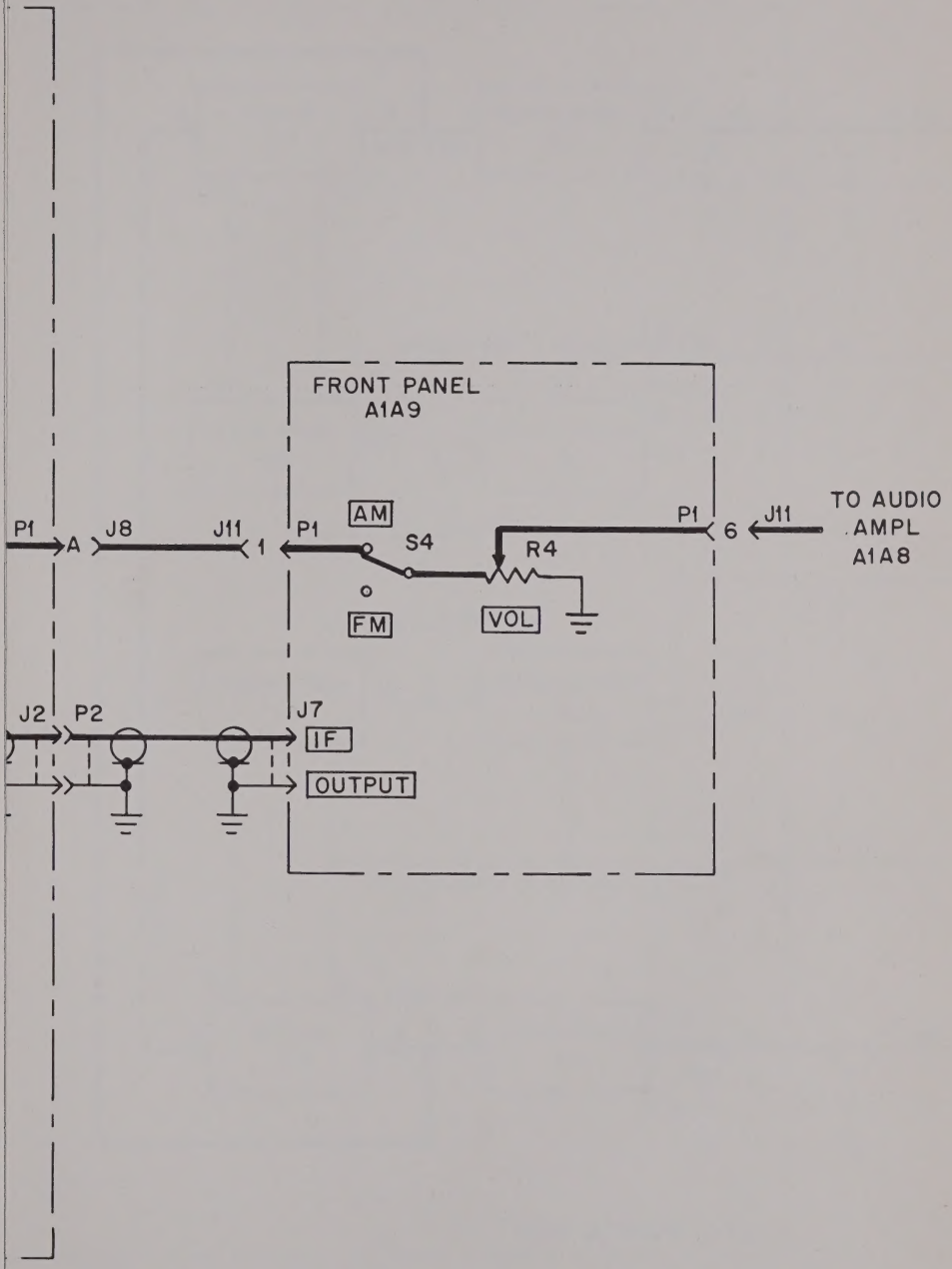


Figure 4-26. Beat Frequency Oscillator, Servicing Block Diagram

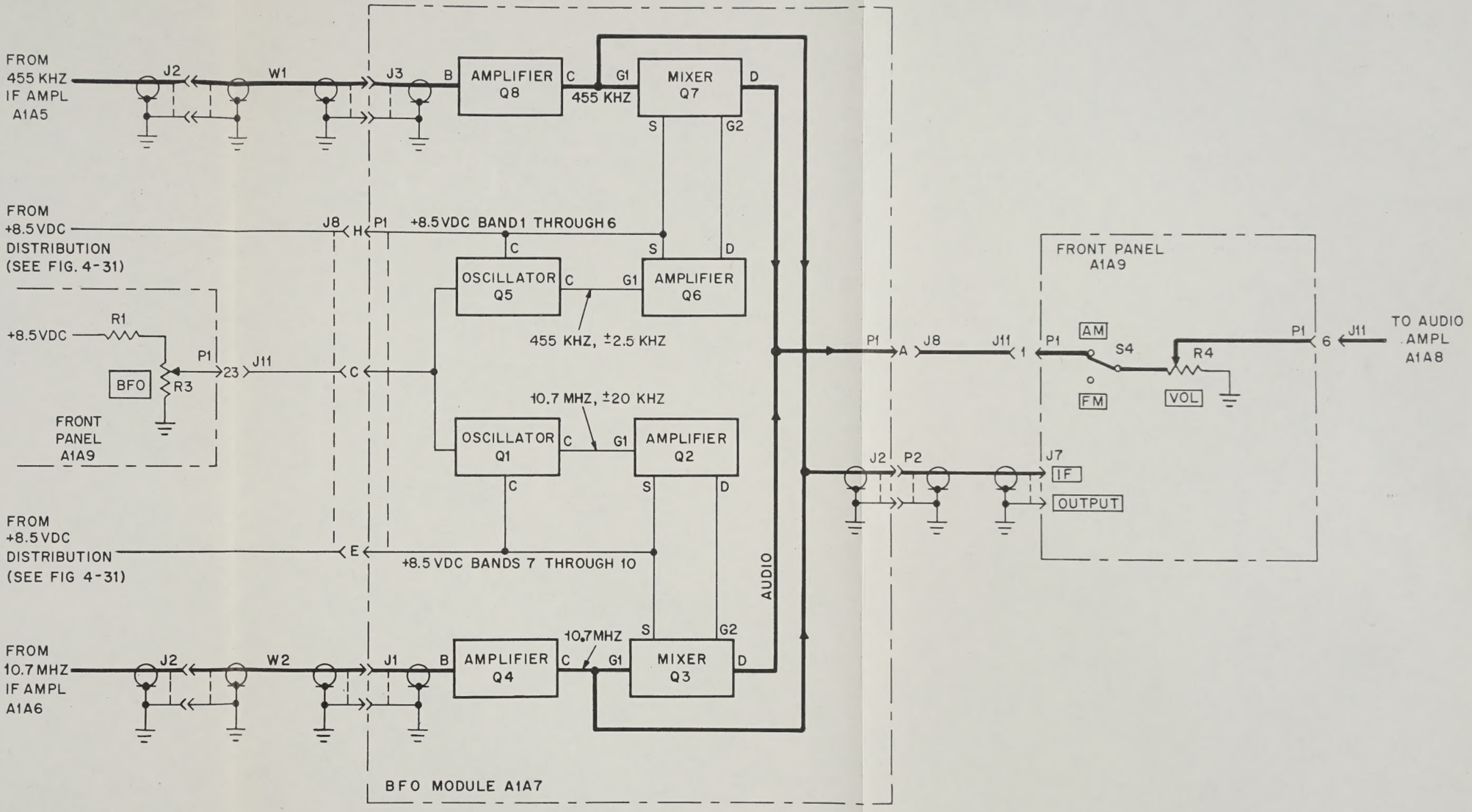


Figure 4-26. Beat Frequency Oscillator, Servicing Block Diagram

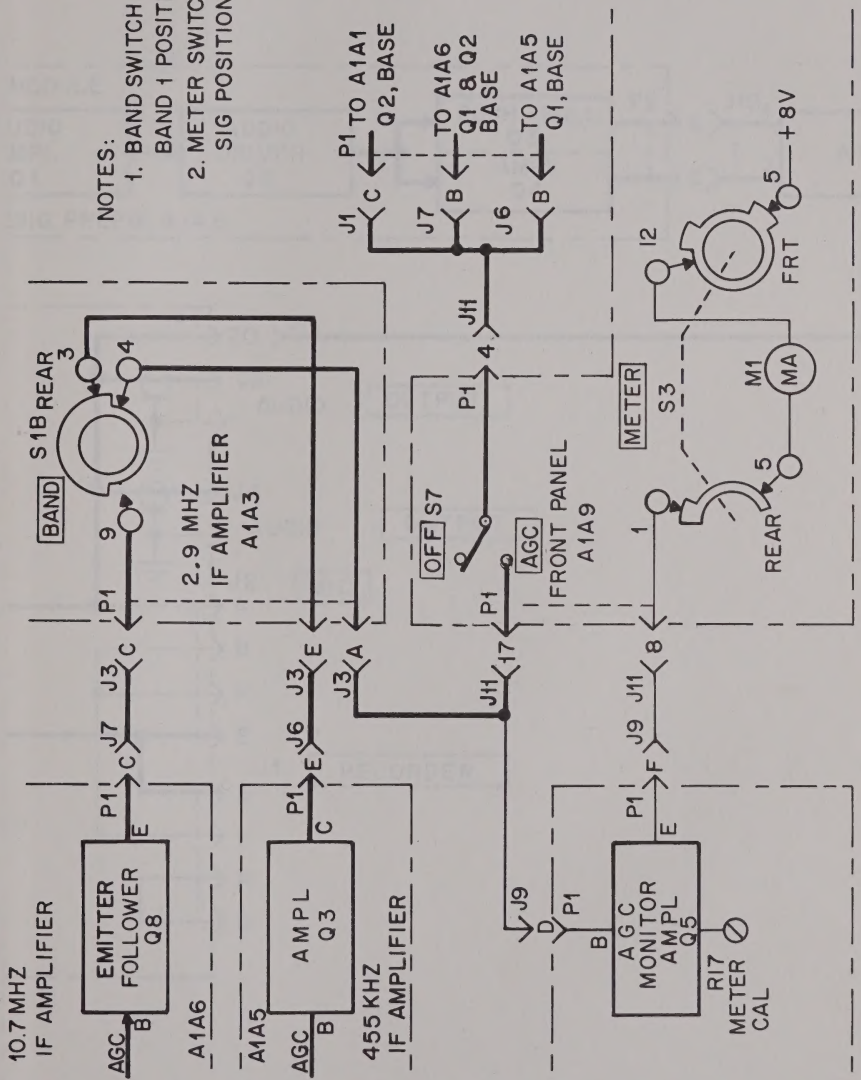
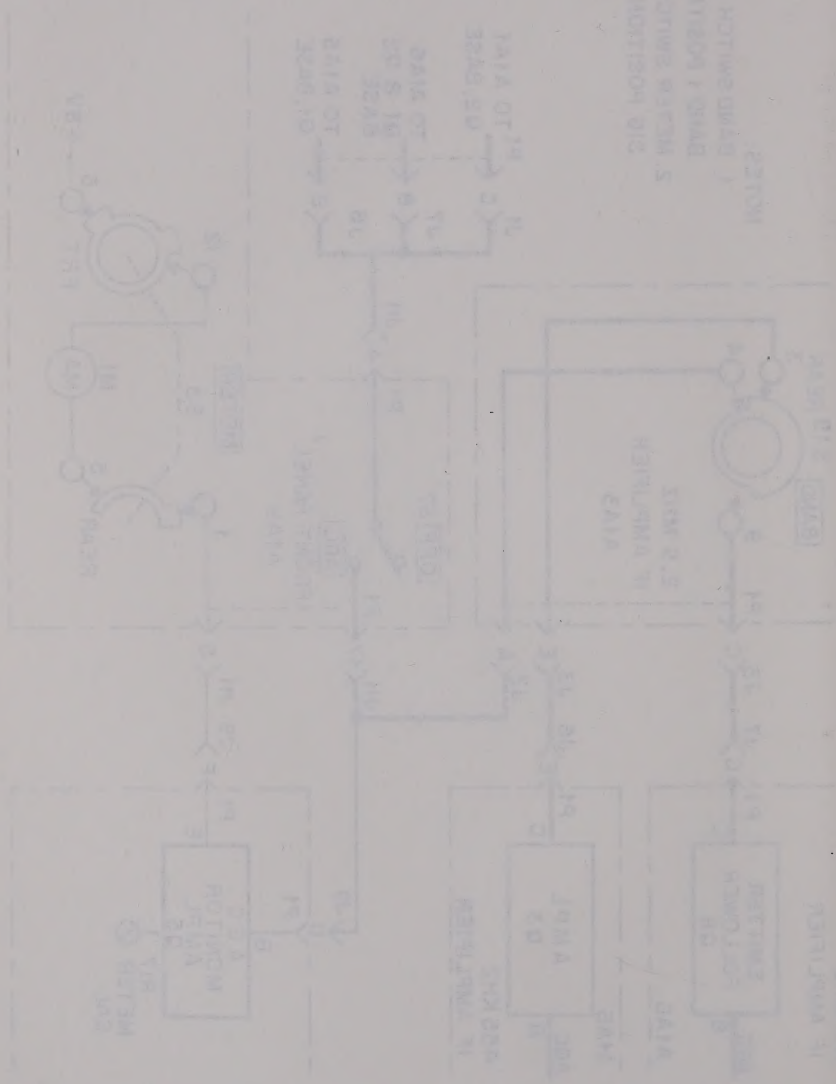


Figure 4-27. AGC Servicing, Block Diagram



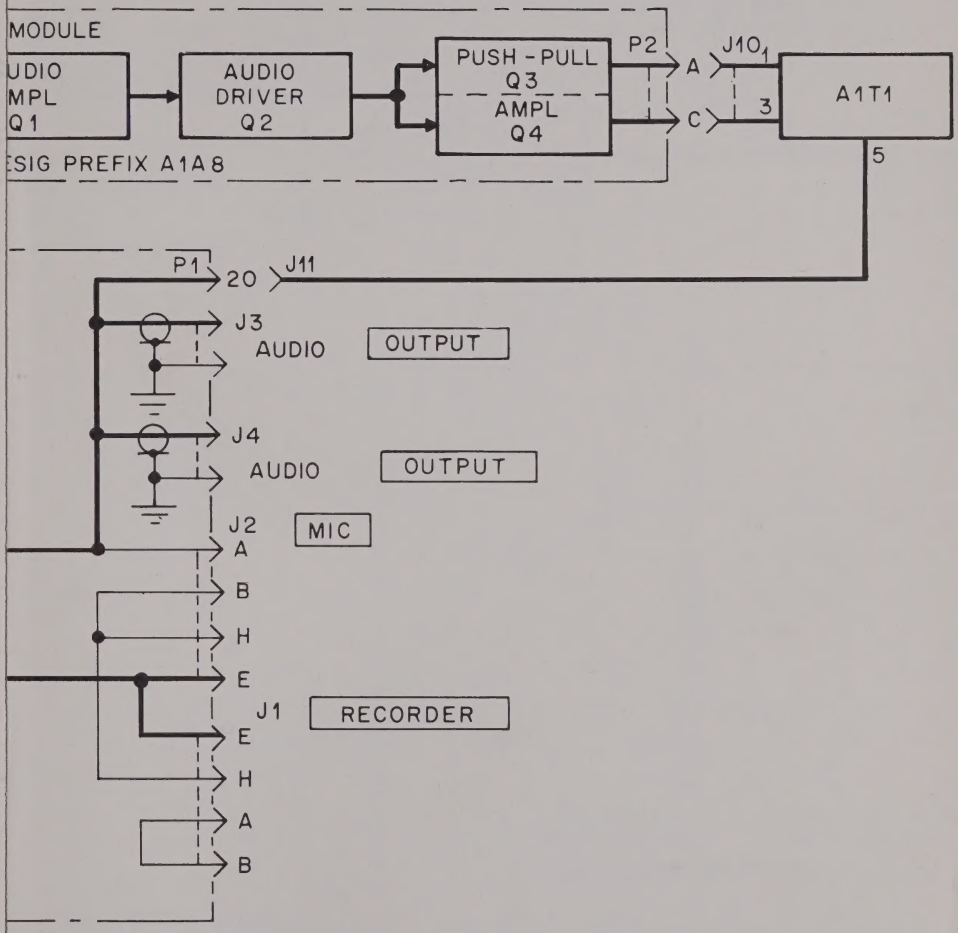
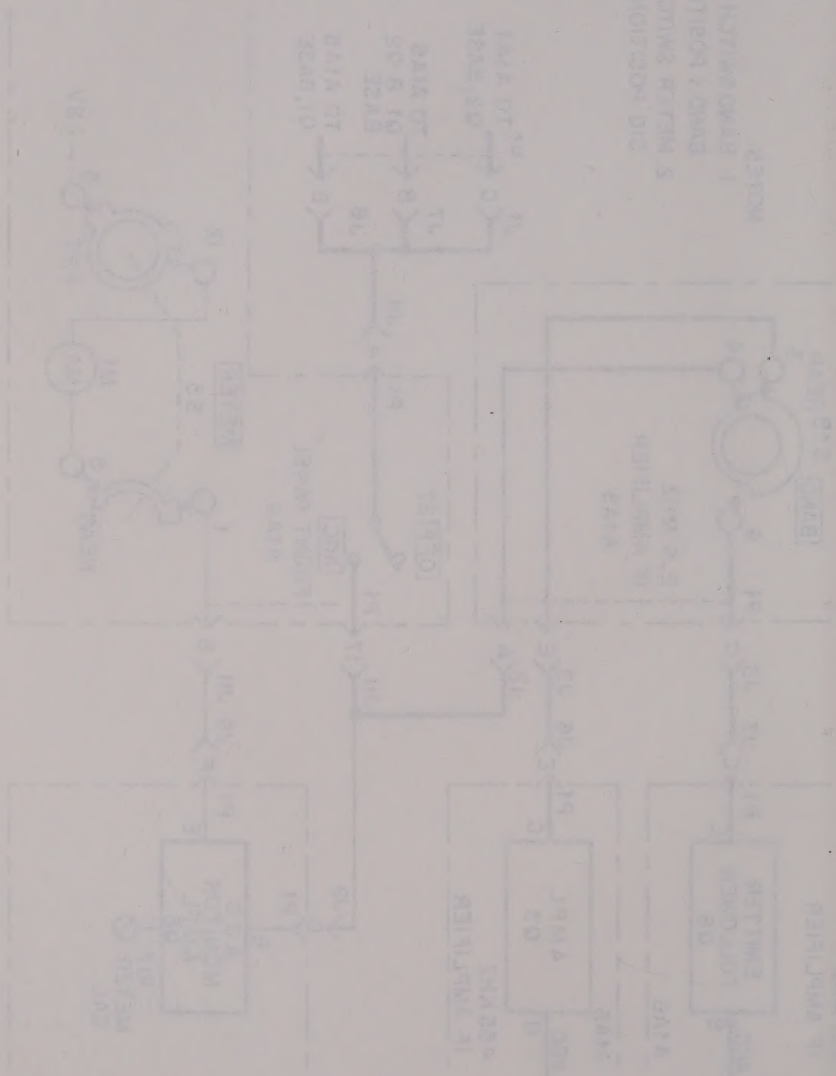


Figure 4-28. Audio Circuit Module, Servicing Block Diagram



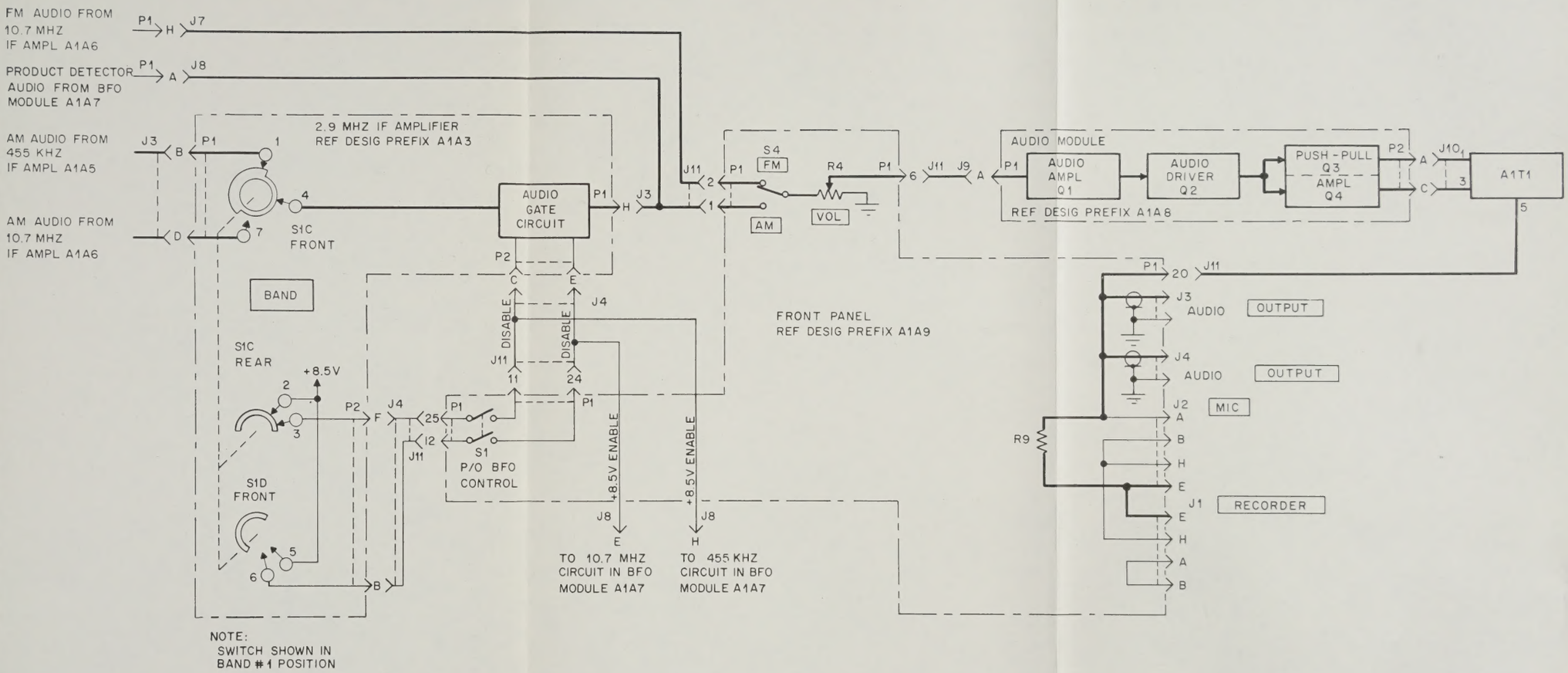


Figure 4-28. Audio Circuit Module, Servicing Block Diagram

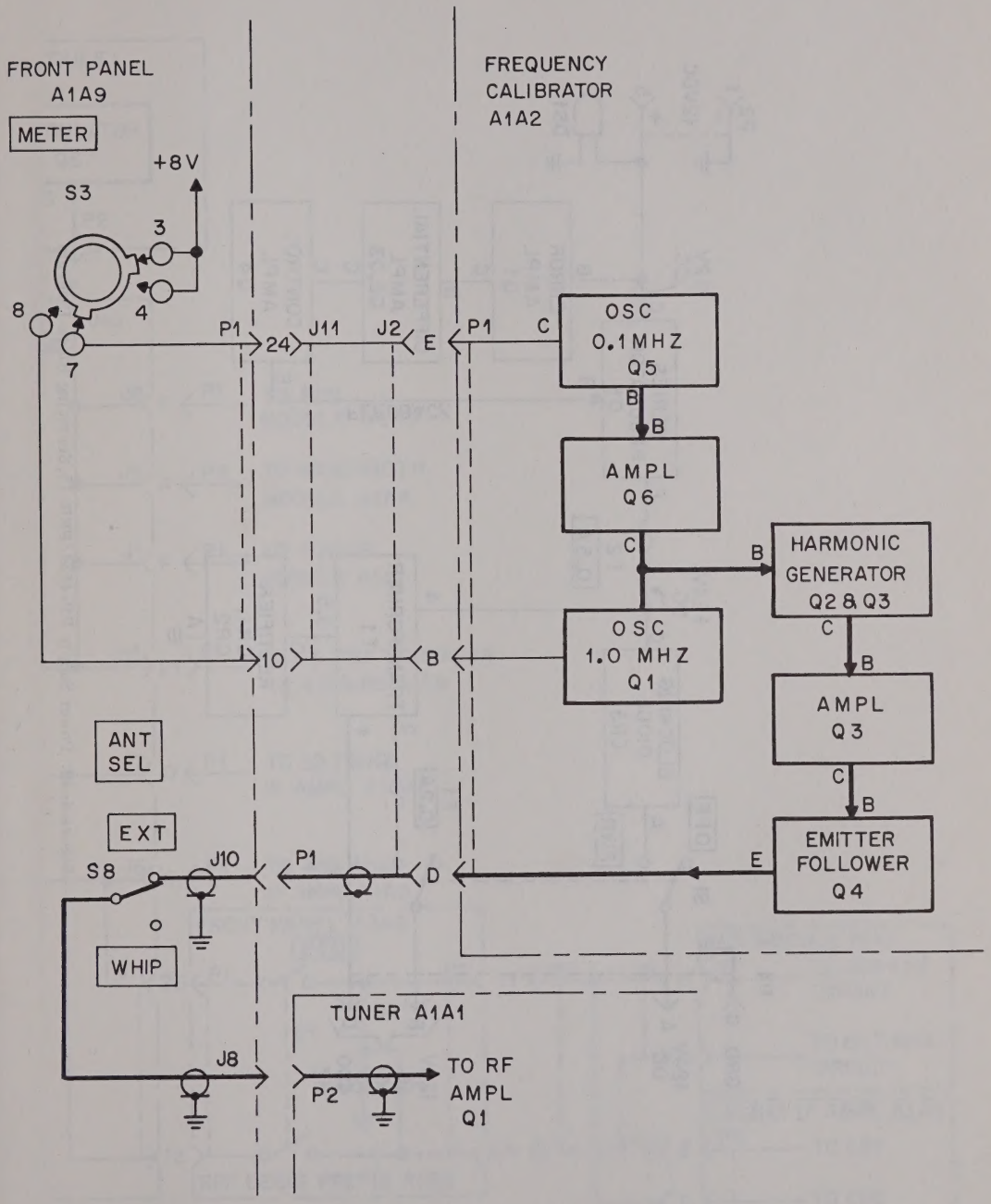


Figure 4-29. Crystal Calibrator, Servicing Block Diagram

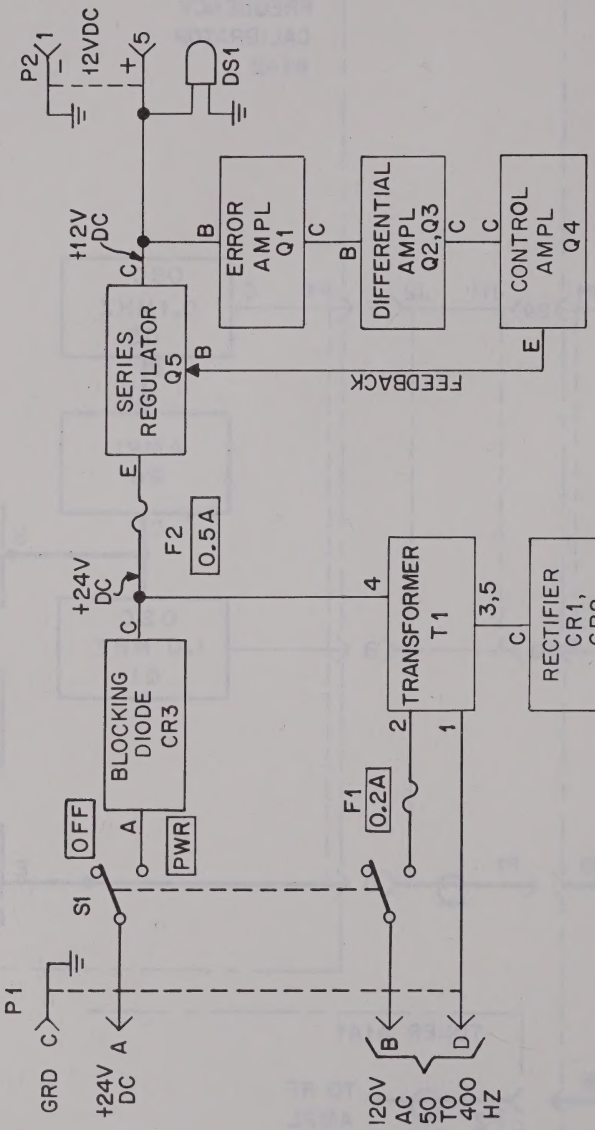


Figure 4-30. Power Supply PP-4834/PRR-15, Servicing Block Diagram

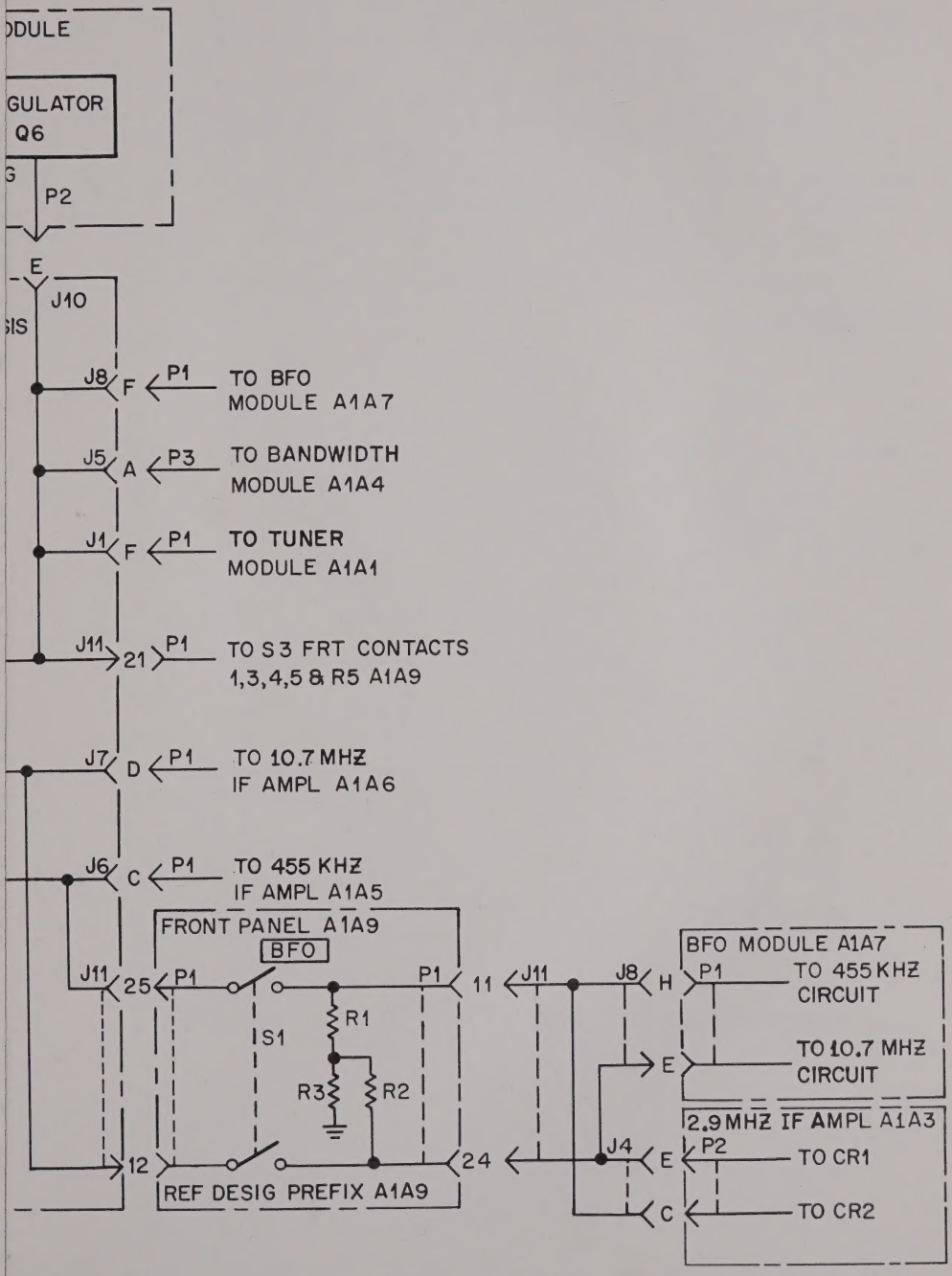


Figure 4-31. +8.5 Volt Distribution Diagram

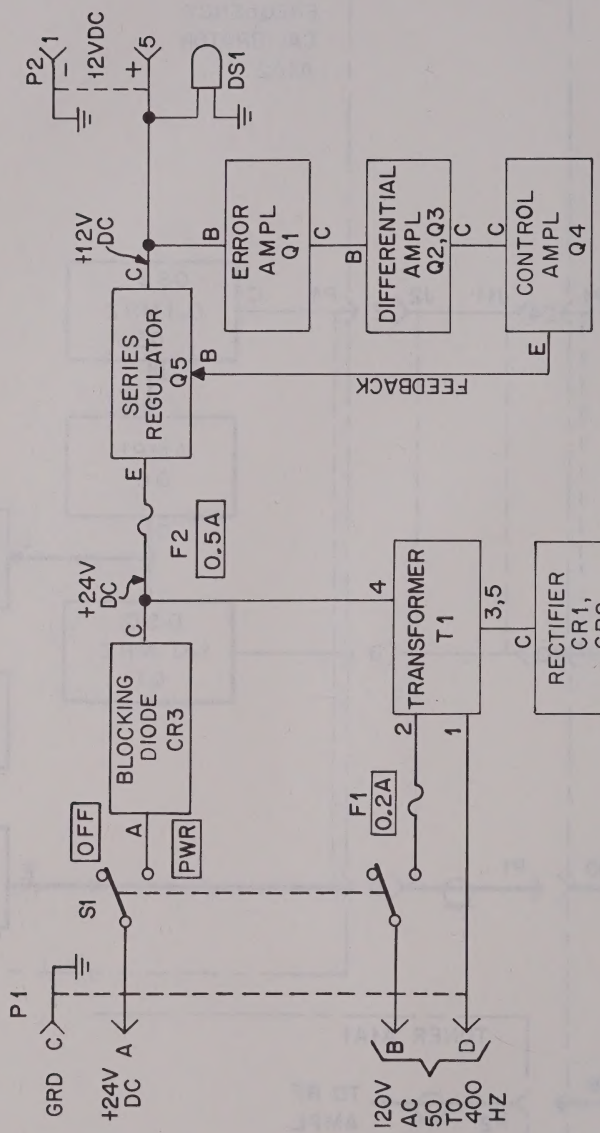


Figure 4-30. Power Supply PP-4834/PRR-15, Servicing Block Diagram

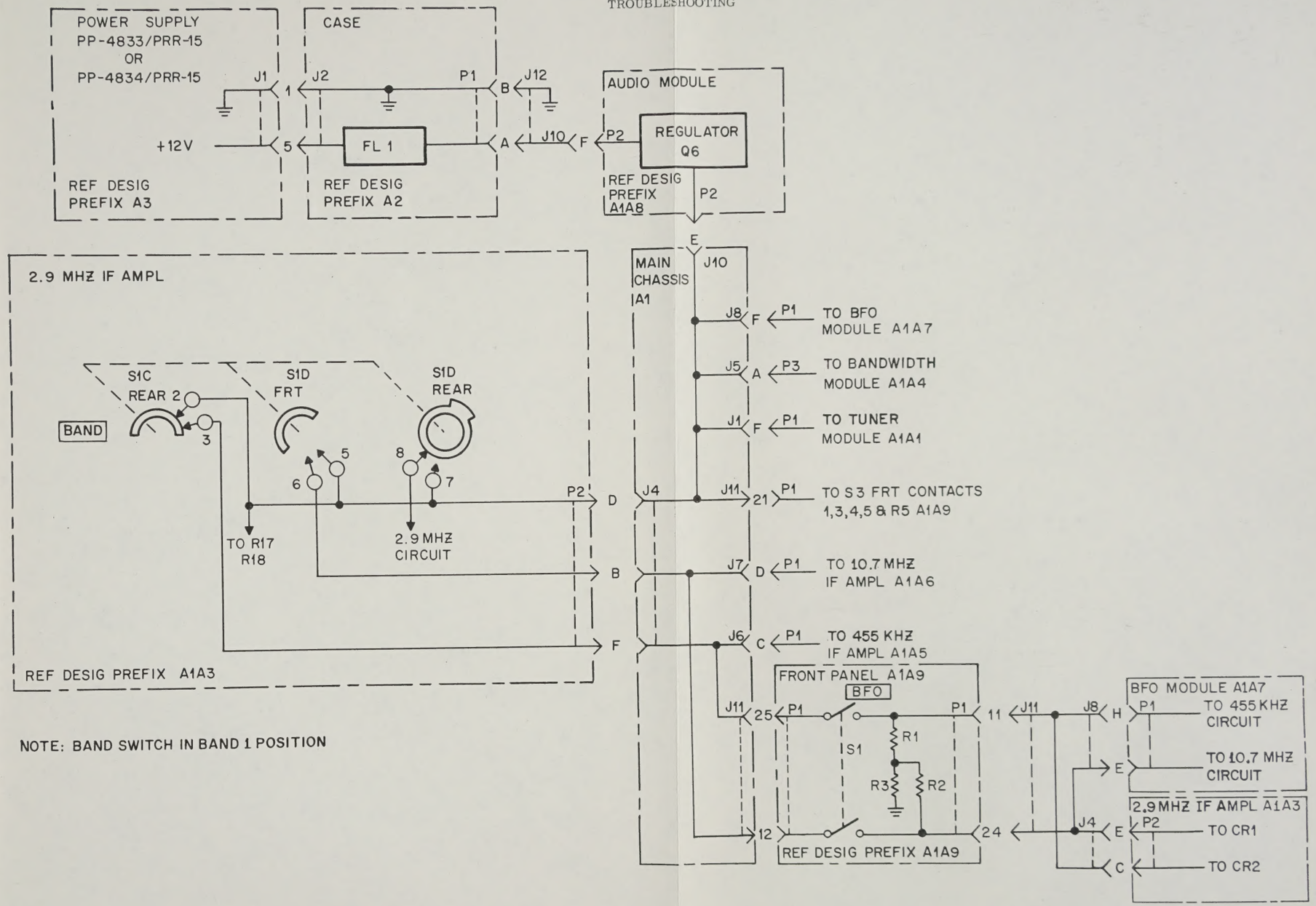
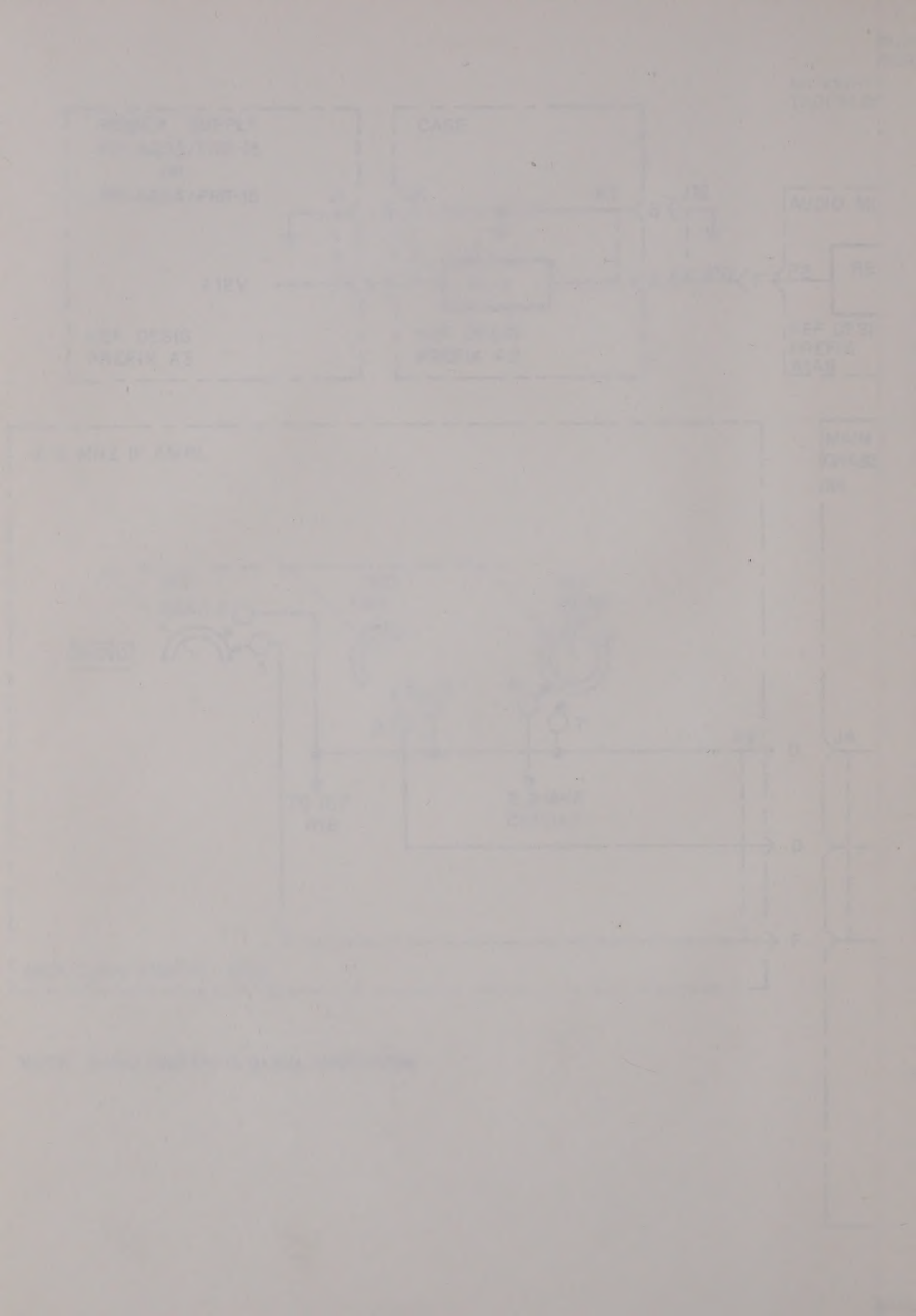


Figure 4-31. +8.5 Volt Distribution Diagram



SECTION 5

MAINTENANCE

5-1. FAILURE, AND PERFORMANCE AND OPERATIONAL REPORTS.

The United States Marine Corps no longer requires the submission of failure reports for all equipments. Failure reports and performance and operational reports are to be accomplished for designated equipments to the extent required by existing directives. All failures shall be reported for those equipments requiring failure reports.

5-2. PREVENTIVE MAINTENANCE.

a. MAINTENANCE STANDARDS. - Performance criteria to be used as maintenance standards are given with the various minimum performance tests in this paragraph. When the equipment has normal indications in all the performance tests, it meets these standards. If a test results in an abnormal indication, perform appropriate trouble-analysis procedures. When the abnormal indication has been corrected to meet these standards, the equipment is ready for return to service.

b. TEST EQUIPMENT REQUIRED. - The test equipment and tools listed in Table 5-1 are required to adjust and align Radio Set AN/PRR-15 electrically.

c. MAINTENANCE LEVELS.

(1) FIELD MAINTENANCE. - For field maintenance level, the preoperational checks described in paragraph 2-6c will indicate the relative performance factor of the equipment.

(2) DEPOT MAINTENANCE. - At depot level, the tests specified in paragraph (d) below shall be performed whenever a major repair of the equipment has been accomplished. In the event a module has been overhauled, only those tests applicable to the specific module need be performed unless otherwise specified as mandatory.

d. PERFORMANCE TESTS. - The tests listed in Table 5-2 shall be used for final checkout of repaired circuits at depot level maintenance.

(1) POWER SUPPLY OUTPUT AND RIPPLE.

Step 1. Connect equipment as shown in Figure 5-1 to a 120 volt 50 to 400 Hz single phase powersource.

Step 2. Place Power Supply PP-4834/PRR-15 POWER-OFF switch to POWER.

Step 3. Adjust variac for reading of 120 volts on ac monitor. Check output for a reading of 11.75 volts to 12.25 volts on the multimeter. Note the reading.

Step 4. Reduce setting of variac until ac monitor indicates 105 volts. Check output for a ±0.3% maximum variation from level indicated in Step 3.

Step 5. Adjust variac for 135 volts on ac monitor. Check output for a ±0.3% maximum variation from level indicated in Step 3.

Step 6. Remove dummy load and check output voltage. Voltage shall not vary more than ±0.5% from level indicated in Step 3.

Step 7. Reduce variac setting until ac monitor indicates 105 volts. Output voltage shall not vary more than ±0.5% from level indicated in Step 3.

Step 8. Reconnect dummy load.

Step 9. Connect ac voltmeter across dummy load.

Step 10. Adjust variac for a reading of 120 volts on ac monitor. Check ripple voltage on ac voltmeter. Ripple voltage shall not exceed 5 millivolts.

Step 11. Turn off all equipment.

Step 12. Reconnect equipment as shown in Figure 5-2.

Step 13. Turn on Harrison Lab Power Supply and adjust for 24 volts input.

Step 14. Turn on Power Supply PP-4834/-PRR-15.

Step 15. Check for an output level between 11.75 volts and 12.25 volts.

Step 16. Set input voltage level to 19.2 volts. Then check output level for a ±0.3% maximum variation from level in Step 15.

Step 17. Set input voltage level to 28.8 volts then check output level for a ±0.3% maximum variation from level in Step 15.

Step 18. Turn off all equipment.

(2) RECEIVER VOLTAGE STABILIZER.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d.

Step 2. Turn on external power supply and adjust for an output of 10.5 volts.

Step 3. Connect equipment as shown in Figure 5-3.

Step 4. Turn receiver VOL control clockwise to midrange, then measure output of voltage stabilizer between A1A8P2-E and ground. Output shall be 8.0 volts to 9.1 volts.

Step 5. Adjust power supply to 15 volts and again measure output of voltage stabilizer between P2-E and ground. Output shall be 8.0 volts to 9.1 volts.

Step 6. Turn off power supply and disconnect equipment.

(3) FREQUENCY RESPONSE AND DISTORTION.

Step 1. Connect equipment as shown in Figure 5-4.

Step 2. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

TABLE 5-1. TEST EQUIPMENT AND SPECIAL TOOLS

QTY	ITEM	NOMENCLATURE		REQUIRED FOR	
		RECOMMENDED	ALTERNATE	FIELD	DEPOT
1	Signal Generator	HP-606A	AN/URM-25	X	X
1	Signal Generator	AN/URM-48		X	X
1	Signal Generator	HP-608C		X	X
1	Sweep Generator	HP-3211A W/HP-3212A Plug-ins			X
1	Counter	CP-843 (P)/U	HP-5245L	X	X
1	Distortion Analyzer	TS-1856/U	HP-330D		X
1	Oscilloscope	AN/USM-117		X	X
1	Power Meter	TS-585D/U	OP-182B	X	X
1	Multimeter	AN/PSM-4D	AN/PSM-4A	X	X
1	Multimeter	ME-25( )/U		X	X
1	Multimeter	ME-6D/U	ME-6 C/U		X
1	Power Supply	Harrison Lab Model 865B	Lamba Electronics Model 71		X
1	Variac	General Radio Model W5MT3			X
1	Audio Generator	HP-200 AB	TS-352 A/U		X
1	Alignment Tool	68G3030		X	X
1	Extender Cable	52G3096		X	X
2	Extender Cables	52G3097		X	X

TABLE 5-2. PERFORMANCE TEST

TEST	PARAGRAPH NUMBER	FIGURE NUMBER (S)
Power Supply Output and Ripple	5-2d(1)	5-1, 5-2
Receiver Voltage Stabilizer	5-2d(2)	5-3
Frequency Response and Distortion	5-2d(3)	5-4
AGC Circuit	5-2d(4)	5-5
Frequency Calibrator Circuit	5-2d(5)	5-6
Beat Frequency Oscillator Circuit	5-2d(6)	5-7
Receiver Sensitivity	5-2d(7)	5-8
Receiver Selectivity	5-2d(8)	5-9
Tuner Tracking	5-2d(9)	5-10

Step 3. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to AGC
B. F. O. control to OFF
BANDWIDTH switch to WIDE

Step 4. Tune the receiver to 4. 5 MHz ±500 kHz.

Step 5. Tune the signal generator to the frequency of the receiver.

Step 6. Set output of signal generator to 5 microvolts.

Step 7. Set the signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation.

Step 8. Set the VOL control on the receiver to obtain maximum volume.

Step 9. Power output shall be 50 milliwatts minimum.

Step 10. Increase the output of the signal generator to 1000 microvolts. Power output shall be 200 milliwatts minimum.

Step 11. Adjust VOL control to obtain a 200 milliwatt reading on the power meter.

Step 12. Check that harmonic distortion is 15% or less on the distortion analyzer.

Step 13. Turn the modulation switch on the signal generator to external position.

Step 14. Set the audio generator frequency to 1700 Hz using the counter.

Step 15. Set the signal generator output to 1000 microvolts.

Step 16. Adjust the audio generator output to obtain 30% modulation.

Step 17. Adjust VOL control to obtain a 200 milliwatt reading on the power meter.

Step 18. Set the audio generator to 300 Hz, using the counter.

Step 19. Repeat Steps 15 and 16 and note power output.

Step 20. Set the audio generator to 3000 Hz using the counter.

Step 21. Repeat Steps 15 and 16 and note power output. Output shall be between 100 milliwatts and 400 milliwatts.

(4) AGC CIRCUIT.

Step 1. Connect equipment as shown in Figure 5-5.

Step 2. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

Step 3. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to AGC
B. F. O. control to OFF
BANDWIDTH switch to WIDE
VOL control to maximum
BAND switch to 1
ANT switch to EXT.

Step 4. Tune receiver to 540 kHz.

Step 5. Set signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation. Set output level to 10 microvolts. Connect generator to EXT ANT input on receiver.

Step 6. Tune signal generator to frequency of receiver.

Step 7. Note output reading on ac voltmeter.

Step 8. Increase signal generator output level to 3000 microvolts in 10 db steps. Output reading shall not exceed 6 db from reading obtained in Step 7.

Step 9. Set receiver BAND switch to 7 and tune to 15 MHz.

Step 10. Set signal generator output level to 10 microvolts.

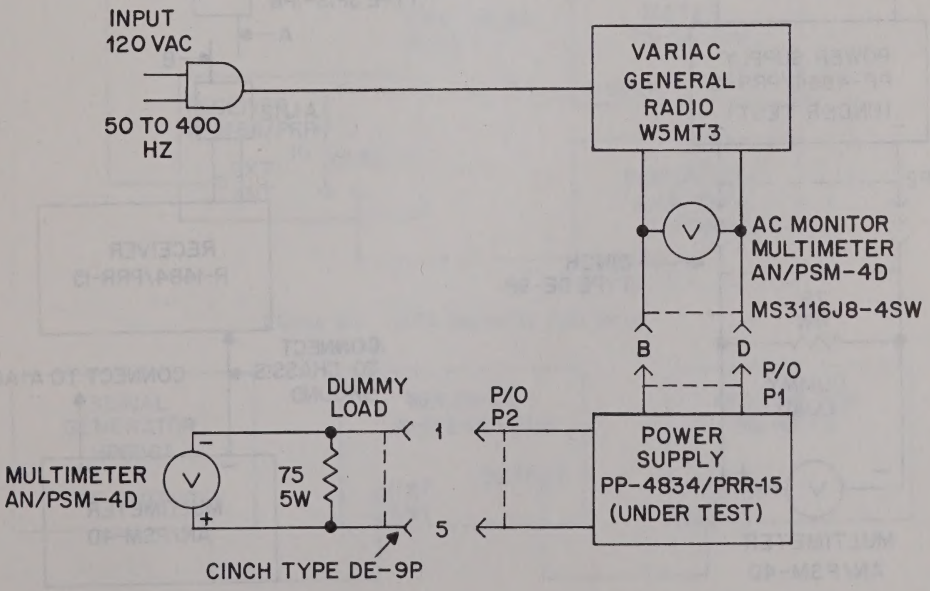


Figure 5-1. Power Supply AC Input Test Setup

Step 11. Tune signal generator to frequency of receiver.

Step 12. Note output reading on ac voltmeter.

Step 13. Increase signal generator output level to 3000 microvolts in 10 db steps. Output reading shall not exceed 6 db from reading obtained in Step 12.

(5) FREQUENCY CALIBRATOR CIRCUIT.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d except do not disconnect cable between housing and receiver. Remove top cover of frequency calibrator module A1A2.

Step 2. Connect equipment as shown in Figure 5-6. Be sure to ground center to receiver frame.

Step 3. Turn on test equipment and receiver and allow equipment 5 minutes to warm up.

Step 4. Set receiver METER switch to CAL 0.1 MHz and check for a frequency between 99,988 and 100,012 Hz.

Step 5. Set receiver METER switch to CAL 1.0 MHz and check for a frequency between 999,900 and 1,000,100 Hz.

Step 6. Disconnect equipment and replace top cover of frequency calibrator module.

(6) BEAT FREQUENCY OSCILLATOR CIRCUIT.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d except do not disconnect cable between housing and receiver.

Step 2. Place receiver upside down and remove top cover of BFO module A1A7.

Step 3. Connect equipment as shown in Figure 5-7.

Step 4. Turn on the counter and allow 5 minutes for warm-up.

Step 5. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to AGC
BANDWIDTH switch to WIDE

Step 6. Turn on receiver.

Step 7. Connect counter to junction of C32 and L7 on BFO printed circuit board, turn receiver B.F.O. control on and measure the frequency at both limits of the control. The frequencies shall be 455 kHz ± 2.5 kHz.

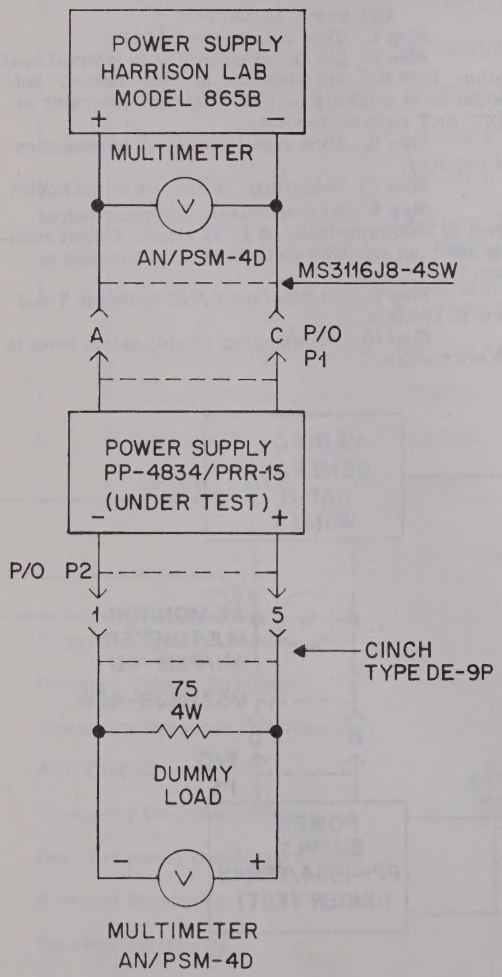


Figure 5-2. Power Supply DC Input Test Setup

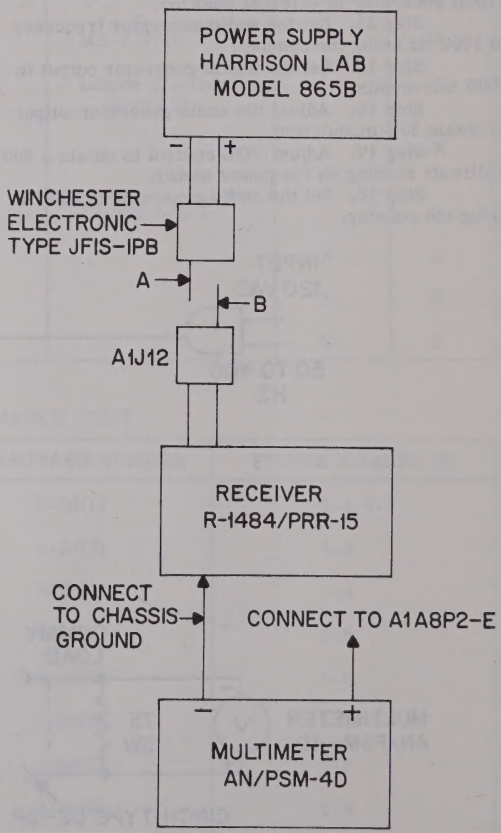


Figure 5-3. Voltage Stabilizer Test Setup

Step 8. Connect counter to junction of C8 and L3 on BFO printed circuit board and measure the frequency at both limits of the B. F. O. control. The frequencies shall be 10.7 MHz ±20 kHz.

Step 9. Allow unit to operate for 5 minutes and repeat Steps 7 and 8.

Step 10. Allow unit to operate for 1 hour and repeat Steps 7 and 8.

(7) RECEIVER SENSITIVITY. (See Table 5-3)

Step 1. Connect equipment as shown in Figure 5-8.

Step 2. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

Step 3. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to AGC
B. F. O. control to OFF
BANDWIDTH switch to WIDE
VOL control to midrange
ANT switch to EXT.

Step 4. Tune the receiver to 540 kHz.

Step 5. Set the signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation.

Step 6. Tune the signal generator to the frequency of the receiver.

Step 7. Adjust VOL control for an output of 0 db on power meter.

Step 8. Alternately turn signal generator modulation OFF and ON and observe output change on power meter.

Step 9. Adjust the RF output as necessary to obtain a 10 db output change on the power meter. Note the carrier input required to produce this change. The input shall be within limits specified in Table 5-3.

Step 10. Repeat Steps 5 through 9 for each of the frequencies listed in Table 5-3.

Step 11. Set the AN/URM-48 signal generator for FM operation, internal modulation, 1000 Hz with deviation of 15 kHz.

Step 12. Set receiver FM-AM switch to FM.

Step 13. Repeat Steps 6 through 9 for each of the frequencies listed in Table 5-4. The input shall be within limits specified in Table 5-4.

(8) RECEIVER SELECTIVITY.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d except do not disconnect cable between housing and receiver.

Step 2. Connect equipment as shown in Figure 5-9.

Step 3. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

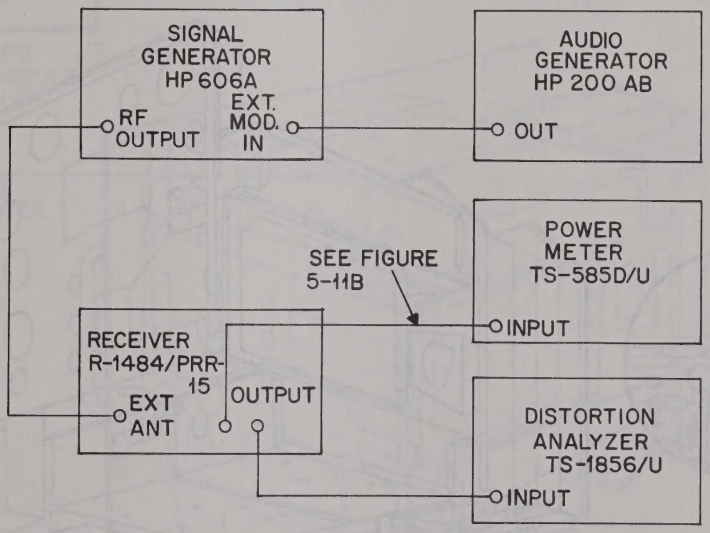


Figure 5-4. Audio Amplifier Test Setup

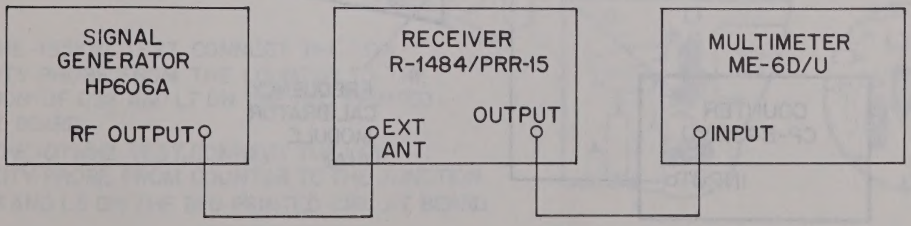


Figure 5-5. AGC Test Setup

Step 4. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to AGC
B. F. O. control to OFF
VOL control to midrange
BAND switch to 1
ANT switch to EXT

Step 5. Tune the receiver to 1000 kHz.

Step 6. Set receiver BANDWIDTH switch to NARROW.

Step 7. Set the signal generator for CW operation and tune to the frequency of the receiver.

Step 8. Adjust the RF output of the signal generator to obtain a reference dc output on the multimeter.

Step 9. Increase the signal generator RF output 6 db from reference.

Step 10. Tune signal generator frequency above F0 until the reference output is obtained on the multimeter.

Step 11. Measure this frequency and record F1.

Step 12. Tune signal generator frequency below F0 until the reference output is obtained on the multimeter.

Step 13. Measure this frequency and record F2.

Step 14. Calculate 6 db bandwidth, F1-F2. Bandwidth shall be within limits specified in Table 5-5.

Step 15. Return the signal generator to F0 and increase RF output 60 db from reference.

Step 16. Repeat Steps 10 through 13.

Step 17. Calculate 60 db bandwidth F1-F2. Bandwidth shall be within limits specified in Table 5-5.

Step 18. Set receiver BANDWIDTH switch to WIDE and repeat steps 7 through 17.

Step 19. Repeat steps 6 through 18 for each of the frequencies listed in Table 5-5.

Note

On Band 9, the bandwidth is checked at 6 db and 40 db.

(9) TUNER TRACKING.

Step 1. Connect equipment as shown in Figure 5-10.

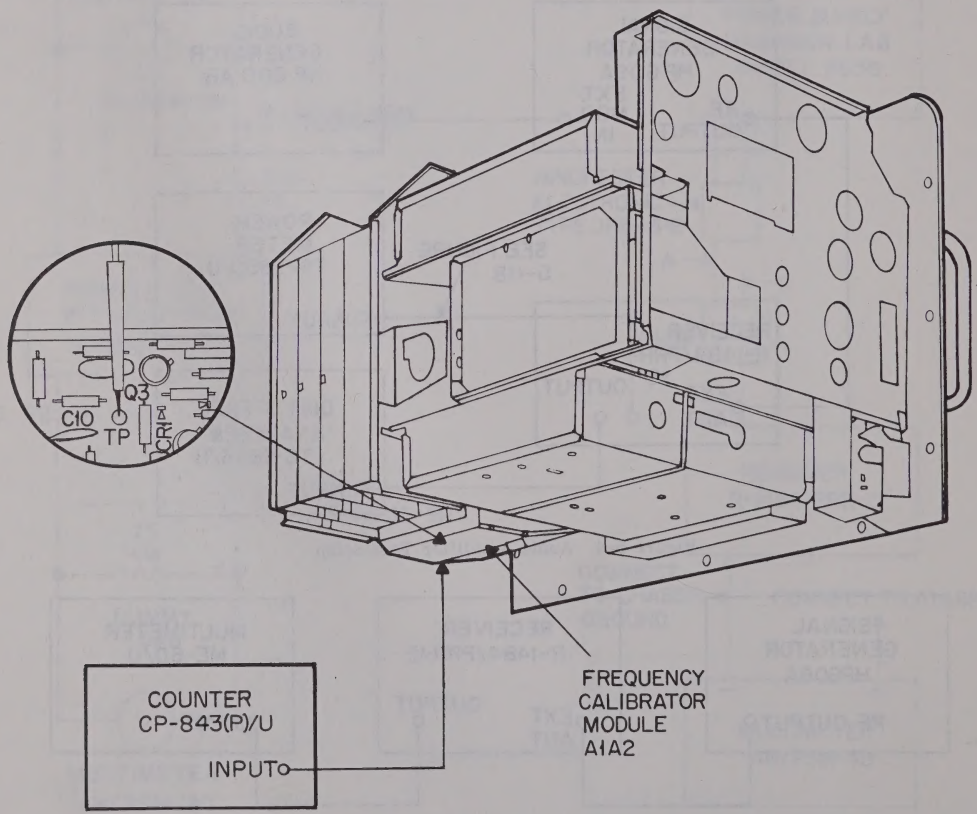


Figure 5-6. Frequency Calibrator A1A2 Test Setup

Step 2. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

Step 3. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to AGC
B. F. O. control to OFF
BANDWIDTH switch to WIDE
VOL control to midrange
ANT switch to EXT

Step 4. Set the signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation. Set output level to approximately 100 microvolts.

Step 5. With the counter, set the signal generator frequency to 540 kHz.

Step 6. Tune the receiver to the frequency of the signal generator. Adjust the TUNING control to obtain a peak output on the power meter.

Step 7. Note the dial tape reading opposite hairline in dial window. The reading shall be within limits specified in Table 5-6.

Step 8. Repeat Steps 6 and 7 for each of the frequencies listed in Table 5-6.

5-3. ALIGNMENT.

a. GENERAL. - The following procedures indicate the correct method for alignment of the various circuits within the receiver. The order of alignment is important and must be followed precisely. When a procedure indicates that another module must be aligned first, this shall be done in all cases or faulty operation of the equipment may result. Waveforms indicating a typical faulty alignment, and waveforms for properly aligned circuits are shown for clarity of the procedure when required. The order of adjustments of transformers and trimmer capacitors must be accomplished as specified. When a procedure indicates that the technician shall repeat certain steps, this repetition is due to interaction of adjustments,

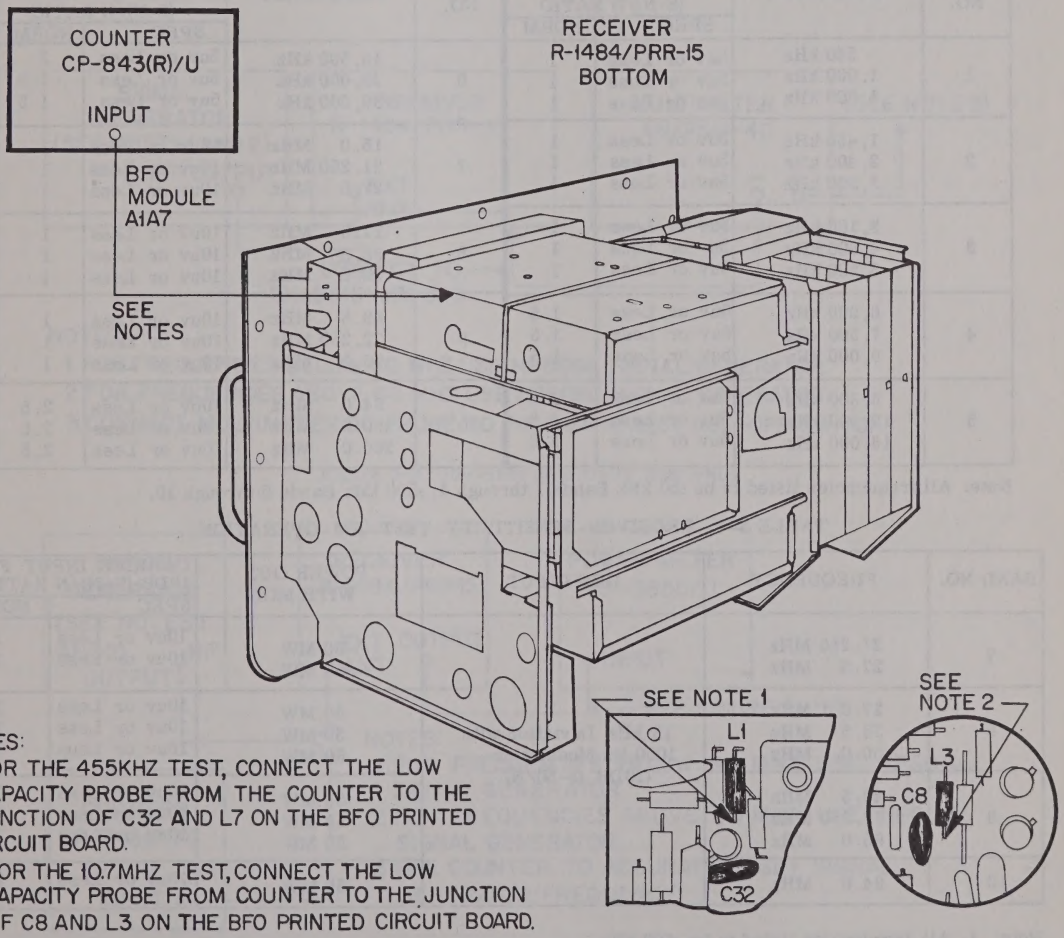


Figure 5-7. Beat Frequency Oscillator Test Setup

and must be followed to ensure correct overall performance. Insertion of the signal from the signal generator can be simplified by constructing the cables shown in Figure 5-11. The alignment tools specified in Table 5-1 shall be used to align the various circuits within the receiver. Alignment tool 68G3030 is used to adjust all coils and trimmers.

b. 455 KILOHERTZ IF AMPLIFIER.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d, except do not disconnect cable between housing and receiver.

Step 2. Connect equipment as shown in Figure 5-12. Remove connector A1A4P4 from J1 of the 455 kHz IF amplifier module and connect signal generator to J1.

Note

If necessary to further separate the receiver from the housing, disconnect cable and insert Extender cable 52G3096.

Step 3. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

Step 4. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to OFF
R. F. ATT. control to midrange
VOL control to midrange

Step 5. Set the signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation. Set output level to approximately 100 millivolts.

TABLE 5-3. RECEIVER SENSITIVITY FOR AM OPERATION

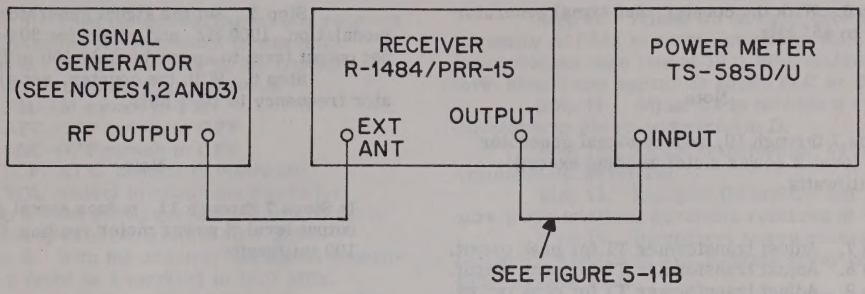
BAND NO.	FREQUENCY	CARRIER INPUT FOR 10DB (S-N)/N RATIO		BAND NO.	FREQUENCY	CARRIER INPUT FOR 10DB (S-N)/N RATIO	
		SPEC	NORM			SPEC	NORM
1	540 kHz	5uv or Less	1	6	15,500 kHz	5uv or Less	3
	1,000 kHz	5uv or Less	1		23,000 kHz	5uv or Less	1.5
	1,500 kHz	5uv or Less	1		30,000 kHz	5uv or Less	1.5
2	1,450 kHz	5uv or Less	1	7	15.0 MHz	10uv or Less	1
	2,400 kHz	5uv or Less	1		21.250 MHz	10uv or Less	1
	3,300 kHz	5uv or Less	1		27.5 MHz	10uv or Less	1
3	3,100 kHz	5uv or Less	1	8	27.0 MHz	10uv or Less	1
	4,600 kHz	5uv or Less	1		38.5 MHz	10uv or Less	1
	6,200 kHz	5uv or Less	1		50.0 MHz	10uv or Less	1
4	6,000 kHz	5uv or Less	1.5	9	49.5 MHz	10uv or Less	1
	7,500 kHz	5uv or Less	1.5		72.250 MHz	10uv or Less	1
	9,000 kHz	5uv or Less	1.5		95.0 MHz	10uv or Less	1
5	8,800 kHz	5uv or Less	1.5	10	94.0 MHz	10uv or Less	2.5
	12,000 kHz	5uv or Less	1.5		150.0 MHz	10uv or Less	2.5
	16,000 kHz	5uv or Less	1.5		200.0 MHz	10uv or Less	2.5

Note: All frequencies listed to be ±50 kHz Bands 1 through 4; ±500 kHz Bands 5 through 10.

TABLE 5-4. RECEIVER SENSITIVITY TEST FM OPERATION

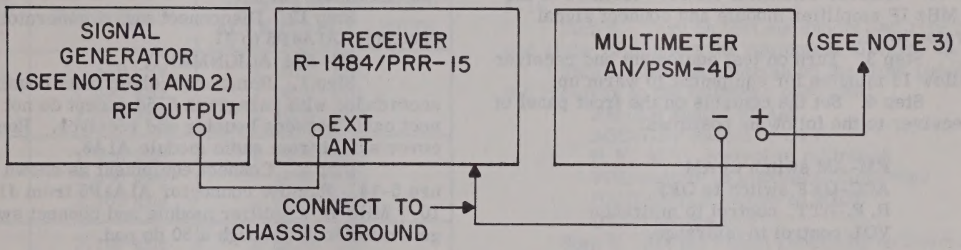
BAND NO.	FREQUENCY	GEN INPUT	POWER OUT WITH MOD	CARRIER INPUT FOR 10DB (S+N)/N RATIO	
				SPEC	NORM
7	21.250 MHz	15 kHz Deviation with 1000 Hz Modulation (10DB (S-N)/N)	50 MW	10uv or Less	1
	27.5 MHz		50 MW	10uv or Less	1
8	27.0 MHz		50 MW	10uv or Less	1
	38.5 MHz		50 MW	10uv or Less	1
	50.0 MHz		50 MW	10uv or Less	1
9	49.5 MHz		50 MW	10uv or Less	1
	72.250 MHz		50 MW	10uv or Less	1
	95.0 MHz		50 MW	10uv or Less	1
10	94.0 MHz		50 MW	10uv or Less	2

Note: 1. All frequencies listed to be ±500 kHz.
2. Limits shown in NORM column are normal for a new equipment but may decrease with age.



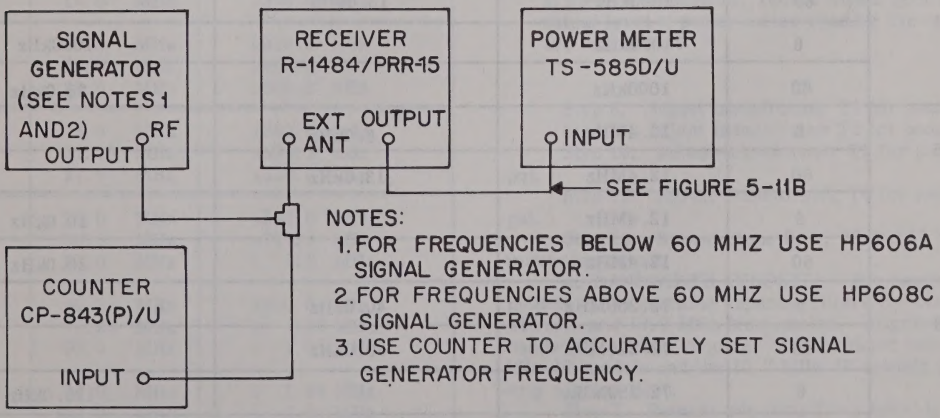
NOTES:
1. FOR FREQUENCIES BELOW 60 MHZ ON AM, USE HP606A SIGNAL GENERATOR.
2. FOR FREQUENCIES ABOVE 60 MHZ ON AM, USE HP608C SIGNAL GENERATOR.
3. FOR BAND 7 THROUGH 10 ON FM, USE AN/URM-48 SIGNAL GENERATOR.

Figure 5-8. Receiver Sensitivity Test Setup



NOTES:
1. FOR FREQUENCIES BELOW 60 MHZ USE HP606A SIGNAL GENERATOR.
2. FOR FREQUENCIES ABOVE 60 MHZ USE HP608C SIGNAL GENERATOR.
3. CONNECT MULTIMETER DC PROBE TO PIN 2 OF A1A9S7 AGC-OFF SWITCH.

Figure 5-9. Receiver Selectivity Test Setup



NOTES:
1. FOR FREQUENCIES BELOW 60 MHZ USE HP606A SIGNAL GENERATOR.
2. FOR FREQUENCIES ABOVE 60 MHZ USE HP608C SIGNAL GENERATOR.
3. USE COUNTER TO ACCURATELY SET SIGNAL GENERATOR FREQUENCY.

Figure 5-10. Tuner Tracking Test Setup

Step 6. With the counter, set signal generator frequency to 455 kHz.

Note

In Steps 7 through 10, reduce signal generator output level if power meter reading exceeds 100 milliwatts.

Step 7. Adjust transformer T1 for peak output.
Step 8. Adjust transformer T2 for peak output.
Step 9. Adjust transformer T3 for peak output.
Step 10. Repeat Steps 7, 8 and 9 to obtain maximum output.
Step 11. Disconnect signal generator and reconnect A1A4P4 to J1.

c. 10.7 MEGAHERTZ IF AMPLIFIER.

(1) AM ALIGNMENT.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d, except do not disconnect cable between housing and receiver.
Step 2. Connect equipment as shown in Figure 5-13. Remove connector A1A4P5 from J1 of the 10.7 MHz IF amplifier module and connect signal generator to J1.
Step 3. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.
Step 4. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to OFF
R.F. ATT. control to midrange
VOL control to midrange

Step 5. Set the signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation. Set output level to approximately 100 millivolts.
Step 6. With the counter, set signal generator frequency to 10.7 MHz.

Note

In Steps 7 through 11, reduce signal generator output level if power meter reading exceeds 100 milliwatts.

Step 7. Adjust transformer T1 for peak output.
Step 8. Adjust transformer T2 for peak output.
Step 9. Adjust transformer T3 for peak output.
Step 10. Adjust transformer T5 for peak output.
Step 11. Repeat Steps 7, 8, 9 and 10 to obtain maximum output.
Step 12. Disconnect signal generator and reconnect A1A4P5 to J1.

(2) FM ALIGNMENT.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d except do not disconnect cable between housing and receiver. Remove cover shield from audio module A1A8.
Step 2. Connect equipment as shown in Figure 5-14. Remove connector A1A4P5 from J1 of the 10.7 MHz IF amplifier module and connect sweep generator to J1 through a 50 db pad.

TABLE 5-5. RECEIVER SELECTIVITY LIMITS

BAND NO.	DB DOWN	FO	NARROW BAND ACCEPTABLE LIMITS	WIDE BAND ACCEPTABLE LIMITS
1	6	1000kHz	6.0kHz	
	60	1000kHz	13.0kHz	
	6	1000kHz		10.0kHz
	60	1000kHz		20.0kHz
5	6	12.4MHz	6.0kHz	
	60	12.4MHz	13.0kHz	
	6	12.4MHz		10.0kHz
	60	12.4MHz		20.0kHz
9	6	72.250MHz	40.0kHz	
	40	72.250MHz	60.0kHz	
	6	72.250MHz		120.0kHz
	40	72.250MHz		490.0kHz

Step 3. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

Step 4. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to FM
AFC-OFF switch to OFF
AGC-OFF switch to OFF
R. F. ATT. control to midrange
VOL control to maximum clockwise

Step 5. Set sweep generator for a 30 cycle per second sweep rate centered at 10.7 MHz.

Step 6. With the counter, set signal generator frequency (used as a marker) to 10.7 MHz.

Step 7. Adjust oscilloscope to observe display.

Step 8. Adjust level of signal generator so that marker appears on display.

Step 9. Adjust sweep generator SWEEP-WIDTH control to obtain a waveform similar to Figure 5-15 waveforms B, C or D. Waveform A would indicate sweep width is too narrow.

TABLE 5-6. TUNER TRACKING LIMITS

BAND NO.	FREQUENCY	DIAL TAPE READING ACCEPTABLE LIMITS
1	540 kHz	± 10.4 kHz
	1,000 kHz	± 20.0 kHz
	1,500 kHz	± 30.0 kHz
2	1,450 kHz	± 29.0 kHz
	2,400 kHz	± 48.0 kHz
	3,300 kHz	± 66.0 kHz
3	3,100 kHz	± 62.0 kHz
	4,600 kHz	± 92.0 kHz
	6,200 kHz	±124.0 kHz
4	6,000 kHz	±120.0 kHz
	7,500 kHz	±150.0 kHz
	9,000 kHz	±180.0 kHz
5	8,800 kHz	±176.0 kHz
	12.0 MHz	±240.0 kHz
	16.0 MHz	±320.0 kHz
6	15.5 MHz	±310.0 kHz
	23.0 MHz	±460.0 kHz
	30.0 MHz	±600.0 kHz
7	15.0 MHz	±300.0 kHz
	21.25 MHz	±425.0 kHz
	27.5 MHz	±550.0 kHz
8	27.0 MHz	±540.0 kHz
	38.5 MHz	±770.0 kHz
	50.0 MHz	± 1.0 MHz
9	49.5 MHz	±990.0 kHz
	72.25 MHz	± 1.45 MHz
	95.0 MHz	± 1.9 MHz
10	94.0 MHz	± 1.88 MHz
	150.0 MHz	± 3.0 MHz
	200.0 MHz	± 4.0 MHz

Step 10. Adjust C6 on ratio detector subassembly A1A6A1 to center waveform such that waveform crosses base line at 10.7 MHz marker. Waveform should now appear as shown in C or D.

Step 11. Adjust C2 to provide a symmetrical waveform as shown in waveform D.

Step 12. Adjust transformer T4 for the most symmetrical waveform.

Step 13. Readjust C2 and C6 and T4 to ensure a symmetrical waveform centered at 10.7 MHz.

Step 14. Disconnect sweep generator and reconnect A1A4P5 to J1. Replace cover shield for audio module A1A8.

d. 2.9 MEGAHERTZ IF AMPLIFIER. - The 2.9 MHz IF amplifier signal is hetrodyned with a 3.555 MHz signal producing a 455 kHz output. This output is applied through the bandwidth module to the 455 kHz IF module. Alignment of the 2.9 MHz IF module requires that the bandwidth module and the 455 kHz IF module be properly aligned first.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d, except do not disconnect cable between housing and receiver.

Step 2. Connect equipment as shown in Figure 5-16.

Step 3. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

Step 4. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to OFF
R. F. ATT. control to midrange
VOL control to maximum clockwise
BANDWIDTH switch to WIDE
BAND switch to 5

Step 5. Set the signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation.

Step 6. With the counter, set signal generator frequency to 2.9 MHz.

Step 7. Adjust signal generator output level to obtain an 80 milliwatt reading on power meter.

Note

In Steps 8 through 12, reduce signal generator output level if power meter reading exceeds 100 milliwatts.

Step 8. Adjust transformer T1 for peak output.

Step 9. Adjust transformer T2 for peak output.

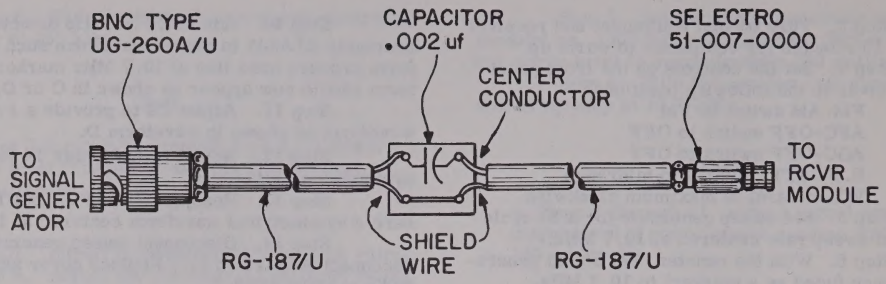
Step 10. Adjust transformer T3 for peak output.

Step 11. Adjust transformer T4 for peak output.

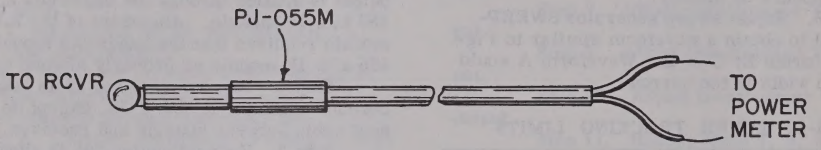
Step 12. Repeat Steps 8, 9, 10 and 11 to obtain maximum output.

e. BANDWIDTH CIRCUIT. - The bandwidth module A1A4 contains separate filters for both the 455 kHz and 10.7 MHz frequencies. Alignment of the bandwidth module requires that the tuner module, 455 kHz IF module and the 10.7 MHz IF module be properly aligned first.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d, except do not disconnect cable between housing and receiver. Remove



A. SIGNAL GENERATOR CABLE



B. POWER METER CABLE

Figure 5-11. Adapter Cables

cover shield from audio module A1A8.

Step 2. Connect equipment as shown in Figure 5-17. Connect signal generator to EXT ANT connector on the receiver.

Step 3. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

Step 4. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AFC-OFF switch to OFF
AGC-OFF switch to OFF
R. F. ATT. control to maximum clockwise
VOL control to midrange
B. F. O. control to OFF
BANDWIDTH switch to WIDE
BAND switch to 1
ANT switch to EXT.

Step 5. Set the signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation.

Step 6. With the counter, set signal generator frequency to 540 kHz.

Step 7. Adjust signal generator output level to approximately 1.5 microvolts.

Step 8. Tune the receiver to the frequency of the signal generator.

Step 9. Set oscilloscope vertical sensitivity to 10 millivolts/centimeter.

Step 10. Turn R. F. ATT. control counterclockwise until signal appears on oscilloscope.

Step 11. Adjust transformer T1 for peak output. If signal enters limiting, increase setting of R. F. ATT. and readjust T1.

Step 12. Set BANDWIDTH switch to NARROW and readjust T1.

Step 13. Disconnect signal generator from receiver and connect output of sweep generator to EXT ANT input of receiver.

Step 14. Adjust sweep frequency to 15.5 MHz.

Step 15. Set the receiver BAND switch to 7, VOL control to maximum clockwise, and tune receiver to 15.5 MHz.

Step 16. Disconnect oscilloscope from receiver output. With a low capacity probe, connect oscilloscope to the input side of C1 on audio module A1A8.

Step 17. Turn R. F. ATT. control fully clockwise then counterclockwise until signal begins to appear on oscilloscope.

Step 18. Set sweep generator sweep rate to approximately 30 Hz. Fine adjustment of the sweep rate may be necessary to eliminate 60 Hz interference with the bandpass display.

Step 19. Adjust transformer T2 for maximum height of waveform.

Step 20. Adjust capacitor C8 for minimum ripple on bandpass waveform.

Step 21. Adjust capacitor C10 for minimum ripple on bandpass waveform.

Step 22. Set receiver BANDWIDTH switch to WIDE.

Step 23. Adjust capacitor C7 for minimum ripple on bandpass waveform.

Step 24. Adjust capacitor C9 for minimum ripple on bandpass waveform.

Step 25. Disconnect equipment and replace cover shield for audio module A1A8.

f. TUNER CIRCUIT. - The alignment of the tuner module requires that the IF amplifier sections of the receiver be properly aligned first. The alignment of the dial tape should also be checked in accordance with paragraph 3-4.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d, except do not disconnect cable between housing and receiver.

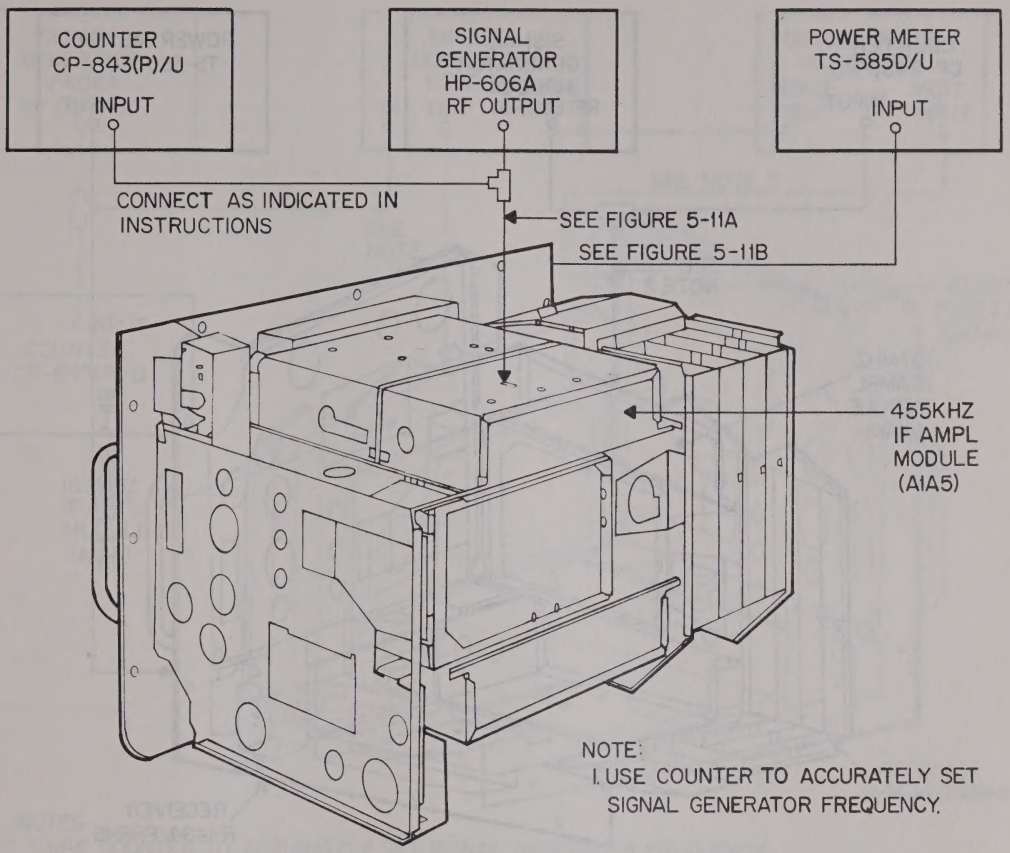


Figure 5-12. 455 kHz IF Amplifier Alignment

Step 2. Connect equipment as shown in Figure 5-18.

Step 3. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

Step 4. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to AGC
VOL control to midrange
BANDWIDTH switch to WIDE
BAND switch to 1
ANT SEL to EXT

Step 5. Set the signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation.

Step 6. With the counter, set signal generator frequency to 540 kHz.

Step 7. Tune the receiver to 540 kHz.

Step 8. Adjust the signal generator output level to approximately 1 microvolt to obtain a reference output on the power meter.

Step 9. Adjust coil L24 for peak output.

Step 10. Set AGC-OFF switch to OFF.

Step 11. Set oscilloscope vertical sensitivity to 10 millivolts/centimeter.

Step 12. Set R. F. ATT. control fully clockwise then slowly counterclockwise until signal appears on oscilloscope.

Note

When performing the alignment adjustments described in the following steps, adjust the R. F. ATT. control as necessary to keep the receiver output signal from limiting.

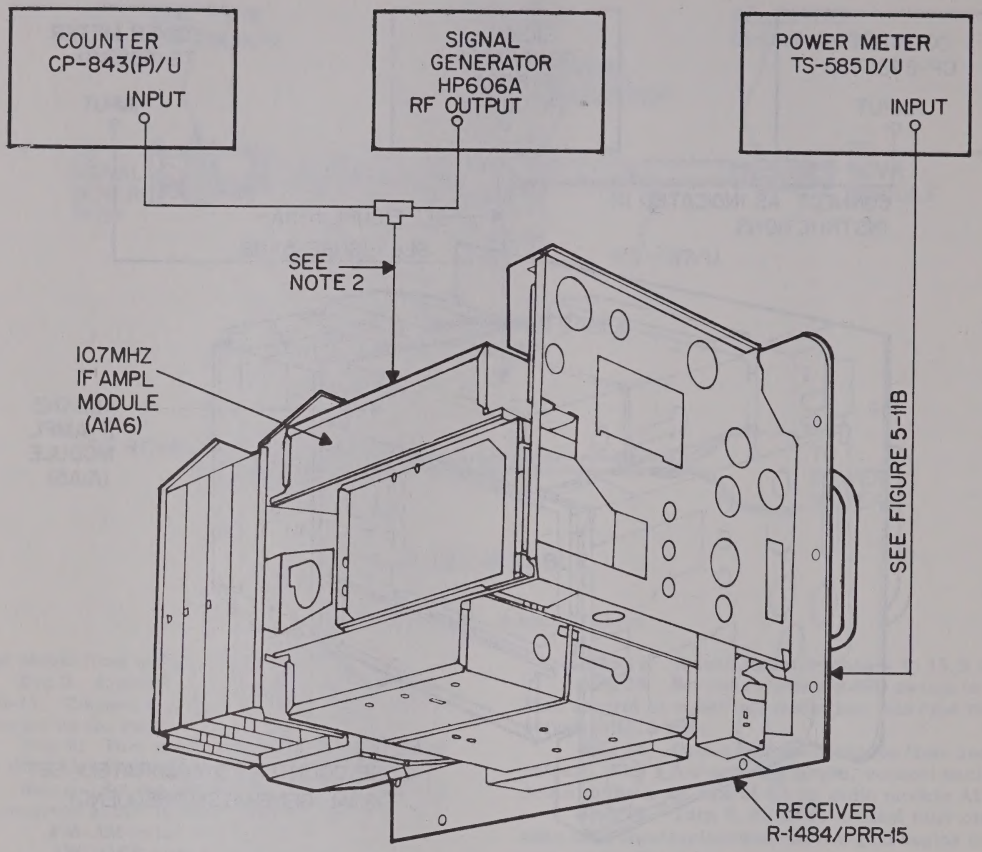
Step 13. Adjust coil L14 for peak output on power meter.

Step 14. Adjust coil L4 for peak output.

Step 15. Adjust transformer T1 for peak output.

Step 16. Repeat Steps 13, 14 and 15 to obtain maximum output.

Step 17. Repeat the procedures in Steps 5 through 16 for the low end of bands 2 through 10. Refer to Table 5-7 for required frequencies and corresponding coil adjustments. Use the HP608C signal



NOTES:
1. USE COUNTER TO ACCURATELY SET SIGNAL GENERATOR FREQUENCY.
2. SEE FIGURE 5-11A, CONNECT AS INDICATED IN INSTRUCTIONS.

Figure 5-13. 10.7 MHz IF Amplifier AM Alignment

generator for frequencies over 60 MHz.

Step 18. Repeat the procedures in Steps 5 through 16 for the high end of bands 10 through 1. Refer to Table 5-7 for required frequencies and corresponding trimmer adjustments.

g. BEAT FREQUENCY OSCILLATOR CIRCUIT. - Alignment of the BFO module requires that the 455 kHz IF module and the 10.7 MHz IF module be properly aligned first.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d, except do not disconnect cable between housing and receiver. Remove top cover of BFO module A1A7.

Step 2. Connect equipment as shown in Figure 5-19.

Step 3. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

Step 4. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to AGC
BANDWIDTH switch to WIDE
VOL control to midrange
BAND switch to 7
ANT switch to EXT

Step 5. Set signal generator for CW operation at 10.7 MHz. Use counter to accurately set the frequency.

Step 6. Adjust signal generator output level to obtain a reference output on power meter.

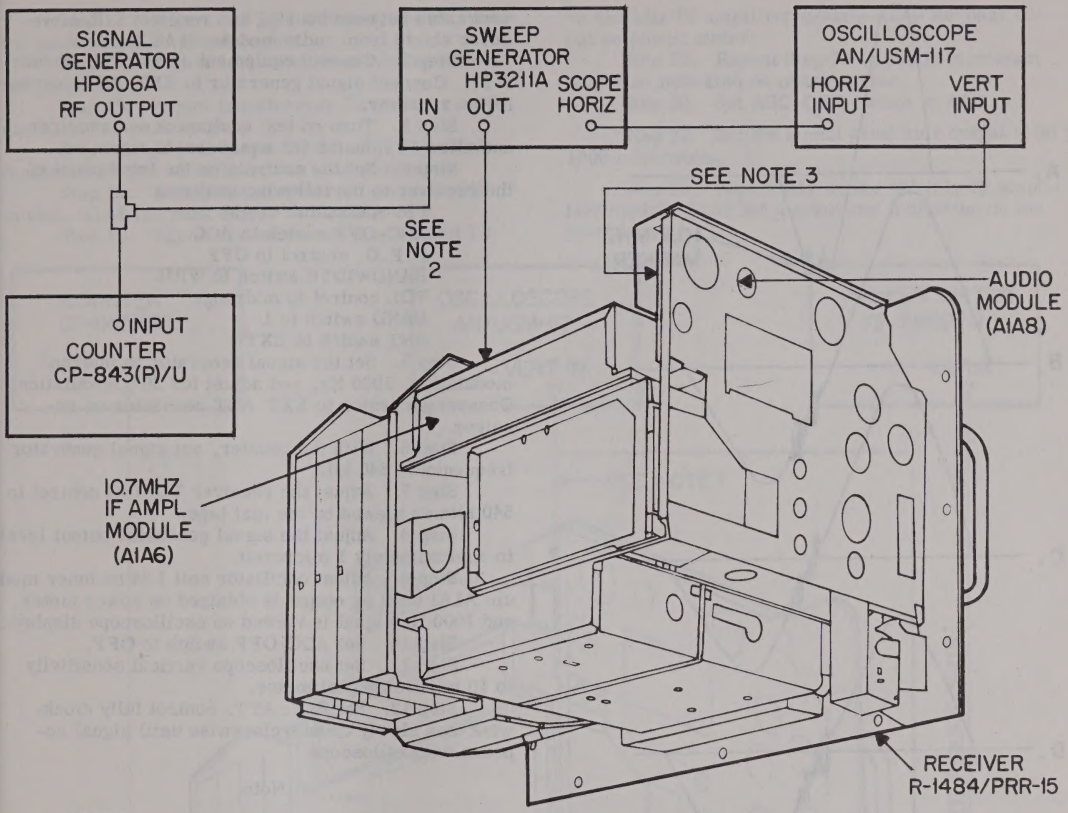
Step 7. Set receiver B.F.O. control to center of range.

Step 8. Adjust transformer T1 for minimum output on power meter.

Step 9. Set B.F.O. control slightly off center to obtain a reference output on power meter.

Step 10. Adjust transformer T2 for maximum output on power meter.

Step 11. Reset B.F.O. control to center and set BAND switch to 1.



NOTES:
1. USE COUNTER TO ACCURATELY SET SIGNAL GENERATOR FREQUENCY.
2. SEE FIGURE 5-11B, CONNECT AS INDICATED IN INSTRUCTIONS.
3. CONNECT TO INPUT SIDE OF C1 ON AUDIO MODULE (A1A8) PRINTED BOARD.

Figure 5-14. 10.7 MHz IF Amplifier FM Alignment

Step 12. With the counter, set the signal generator frequency to 455 kHz.

Step 13. Adjust signal generator output level to obtain a reference output on power meter.

Step 14. Adjust transformer T3 for minimum output on power meter.

Step 15. Connect ac voltmeter to the junction of C32 and T4 on the BFO circuit board.

Step 16. Adjust transformer T4 for maximum output on ac voltmeter.

Step 17. Set B.F.O. control slightly off center to obtain a reference output on power meter.

Step 18. Adjust transformer T5 for maximum output on power meter.

Step 19. Disconnect equipment and replace top cover of BFO module A1A7.

h. FREQUENCY CALIBRATOR CIRCUIT.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d, except do not disconnect cable between housing and receiver. Remove top cover of frequency calibrator module A1A2.

Step 2. Connect equipment as shown in Figure 5-6. Be sure to ground counter to receiver frame.

Step 3. Turn on test equipment and receiver and allow equipment 5 minutes to warm up.

Step 4. Set receiver METER switch to CAL 0.1 MHz.

Step 5. Adjust coil L2 for a reading as close as possible to 100 kHz on the counter.

Step 6. Set receiver METER switch to CAL 1 MHz.

Step 7. Adjust capacitor C5 for a reading as close as possible to 1.0 MHz on the counter.

Step 8. Disconnect equipment and replace top cover of frequency calibrator module A1A2.

i. FINAL ALIGNMENT. - Final alignment of the receiver is necessary to ensure correct overall performance. The following procedure shall be performed prior to the final checkout of the receiver at the Depot maintenance level.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d, except do not discon-

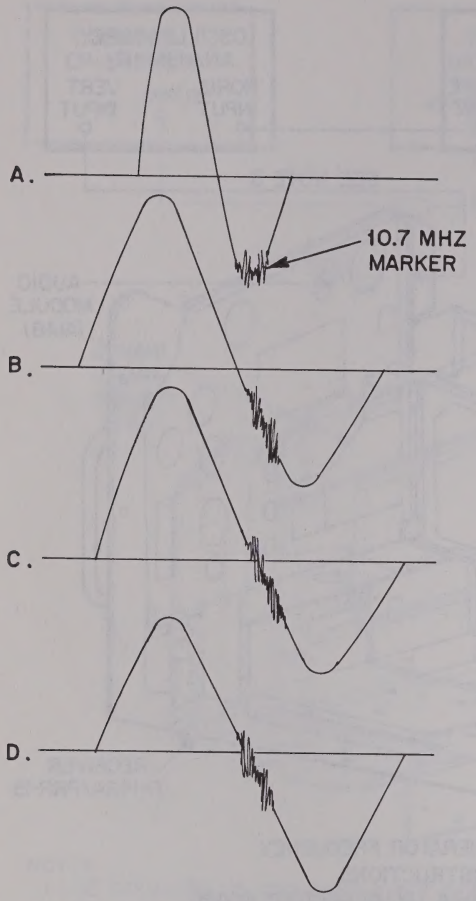


Figure 5-15. Ratio Detector Output Waveforms

nect cable between housing and receiver. Remove cover shield from audio module A1A8.

Step 2. Connect equipment as shown in Figure 5-17. Connect signal generator to EXT ANT connector on receiver.

Step 3. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

Step 4. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to AGC
B. F. O. control to OFF
BANDWIDTH switch to WIDE
VOL control to midrange
BAND switch to 1
ANT switch to EXT

Step 5. Set the signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation. Connect generator to EXT ANT connector on receiver.

Step 6. With the counter, set signal generator frequency to 540 kHz.

Step 7. Adjust the receiver TUNING control to 540 kHz as viewed on the dial tape.

Step 8. Adjust the signal generator output level to approximately 1 microvolt.

Step 9. Adjust oscillator coil L24 on tuner module A1A1 until an output is obtained on power meter and 1000 Hz signal is viewed on oscilloscope display.

Step 10. Set AGC-OFF switch to OFF.

Step 11. Set oscilloscope vertical sensitivity to 10 millivolts/centimeter.

Step 12. Set R. F. ATT. control fully clockwise then slowly counterclockwise until signal appears on oscilloscope.

Note

When performing the alignment adjustments in the following steps, adjust the R. F. ATT. control as necessary to keep the receiver output signal from limiting, as viewed on oscilloscope display.

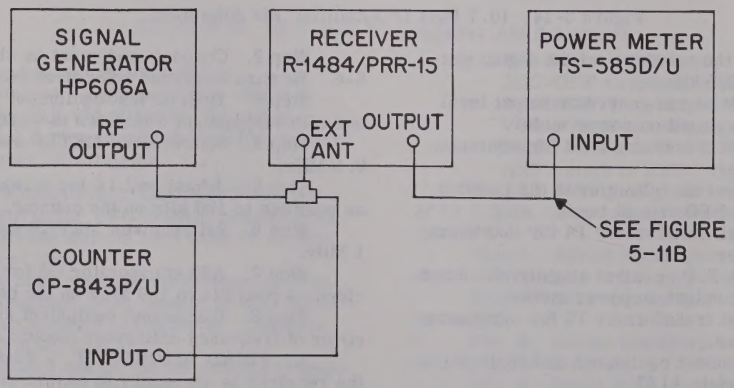


Figure 5-16. 2.9 MHz IF Amplifier Alignment

Step 13. Adjust coil L14 on tuner module A1A1 for peak output on power meter.

Step 14. Adjust coil L4 on tuner module A1A1 for peak output.

Step 15. Adjust transformer T1 on tuner module A1A1 for peak output.

Step 16. Repeat Steps 13, 14 and 15 to obtain maximum output as indicated on power meter.

Step 17. Adjust transformer T1 on bandwidth module A1A4 for peak output on power meter.

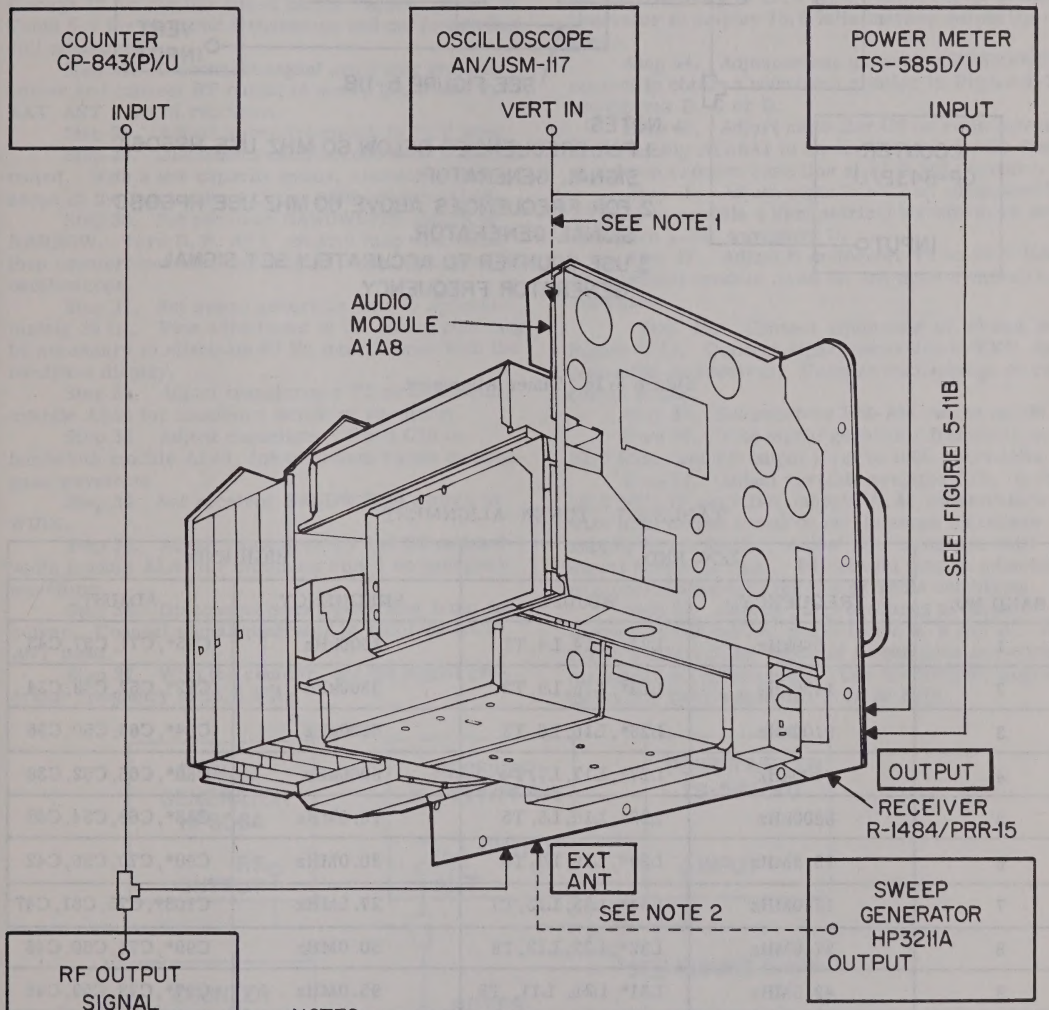
Step 18. Adjust transformers T1, T2 and T3 on 455 kHz IF amplifier module A1A5 for peak output on power meter.

Step 19. Repeat Step 18 to obtain maximum output as indicated on power meter.

Step 20. Set AGC-OFF switch to AGC.

Step 21. Set the signal generator output level to 1000 microvolts.

Step 22. Adjust R11 on the 455 kHz IF amplifier module A1A5 for a minimum indication on the power meter.



NOTES:
1. FOR 10.7MHZ BANDWIDTH ALIGNMENT, CONNECT INPUT OF OSCILLOSCOPE TO INPUT SIDE OF C1 ON AUDIO MODULE A1A8.
2. FOR 10.7MHZ BANDWIDTH ALIGNMENT, CONNECT OUTPUT OF SWEEP GENERATOR TO RECEIVER EXT ANT.
3. USE COUNTER TO ACCURATELY SET SIGNAL GENERATOR FREQUENCY.

Figure 5-17. Bandwidth Circuit Alignment

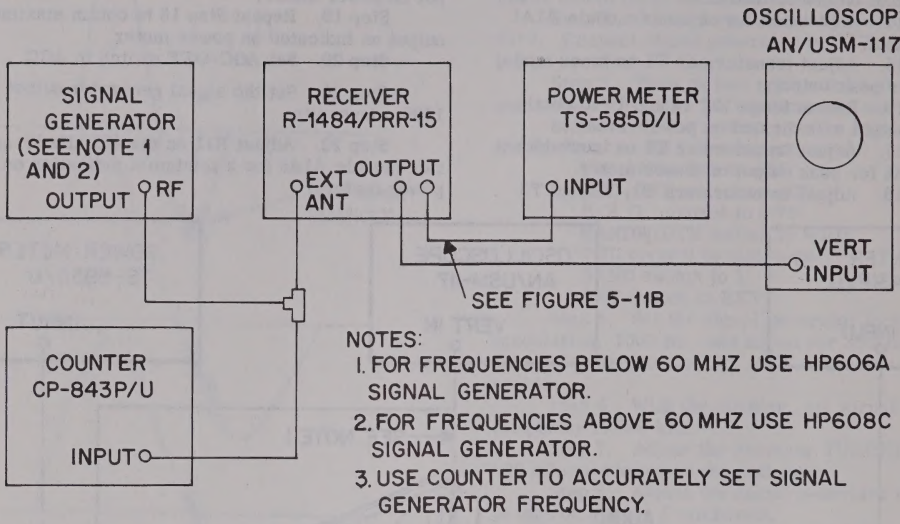


Figure 5-18. Tuner Alignment

TABLE 5-7. TUNER ALIGNMENT

BAND NO.	LOW END		HIGH END	
	FREQUENCY	ADJUST	FREQUENCY	ADJUST
1	540kHz	L24*, L14, L4, T1	1500kHz	C95*, C71, C57, C43
2	1450kHz	L25*, L15, L5, T2	3300kHz	C82*, C62, C48, C34
3	3100kHz	L26*, L16, L6, T3	6200kHz	C84*, C64, C50, C36
4	6000kHz	L27*, L17, L7, T4	9000kHz	C86*, C66, C52, C38
5	8800kHz	L28*, L18, L8, T5	16.0MHz	C88*, C68, C54, C40
6	15.5MHz	L29*, L19, L9, T6	30.0MHz	C90*, C70, C56, C42
7	15.0MHz	L33*, L23, L13, T7	27.5MHz	C103*, C75, C61, C47
8	27.0MHz	L32*, L22, L12, T8	50.0MHz	C99*, C74, C60, C46
9	49.5MHz	L31*, L21, L11, T9	95.0MHz	C97*, C73, C59, C45
10	95.0MHz	L30*, L20, L10, T10	205.0MHz	C96*, C72, C58, C44

* Adjust with AGC-OFF switch in AGC position.

Step 23. Repeat the procedures in Steps 5 through 16 for the low end of bands 2, 3, 4 and 5. Refer to Table 5-7 for required frequencies and corresponding coil adjustments.

Step 24. With receiver tuned to 8800 kHz, adjust transformers T1, T2, T3 and T4 on 2.9 MHz IF amplifier module A1A3 for peak output on power meter.

Step 25. Repeat Step 24 to obtain maximum output.

Step 26. Repeat the procedures in Steps 5 through 16 for the low end of bands 6 and 7. Refer to Table 5-7 for required frequencies and corresponding coil adjustments.

Step 27. Disconnect signal generator from receiver and connect RF output of sweep generator to EXT ANT input of receiver.

Step 28. Adjust sweep frequency to 15.0 MHz.

Step 29. Disconnect oscilloscope from receiver output. With a low capacity probe, connect oscilloscope to the input side of C1 on audio module A1A8.

Step 30. Set receiver BANDWIDTH switch to NARROW. Turn R.F. ATT. control fully clockwise then counterclockwise until signal begins to appear on oscilloscope.

Step 31. Set sweep generator rate to approximately 30 Hz. Fine adjustment of the sweep rate may be necessary to eliminate 60 Hz interference with the bandpass display.

Step 32. Adjust transformer T2 on bandwidth module A1A4 for maximum height of waveform.

Step 33. Adjust capacitors C8 and C10 on bandwidth module A1A4, for minimum ripple on bandpass waveform.

Step 34. Set receiver BANDWIDTH switch to WIDE.

Step 35. Adjust capacitors C7 and C9 on bandwidth module A1A4 for minimum ripple on bandpass waveform.

Step 36. Disconnect sweep generator from receiver. Connect signal generator to receiver EXT ANT input.

Step 37. With the counter, set the signal generator frequency to 15.0 MHz.

Step 38. Adjust transformers T1, T2, T3 and T5 on the 10.7 MHz IF amplifier module A1A6 for peak output on power meter.

Step 39. Repeat Step 38 for maximum output as indicated on power meter.

Step 40. Connect equipment as shown in Figure 5-20.

Step 41. Set receiver FM-AM switch to FM.

Step 42. Set sweep generator for a 30 Hz sweep rate centered at 15.0 MHz.

Step 43. With the counter, set the signal generator frequency to 15.0 MHz. Adjust level of signal generator to display 15.0 MHz marker on oscilloscope.

Step 44. Adjust sweep generator SWEEPWIDTH control to obtain a waveform similar to Figure 5-15, waveforms B, C or D.

Step 45. Adjust capacitor C6 on ratio detector subassembly A1A6A1 to center waveform such that waveform crosses base line at 30.0 MHz marker.

Step 46. Adjust capacitor C2 on subassembly A1A6A1 to provide a symmetrical waveform as shown in Figure 5-15, waveform D.

Step 47. Adjust transformer T4 on 10.7 MHz IF amplifier module A1A6 for the most symmetrical waveform.

Step 48. Connect equipment as shown in Figure 5-17. Connect signal generator to EXT ANT connector on receiver. Connect oscilloscope to receiver output.

Step 49. Set receiver FM-AM switch to AM.

Step 50. With signal generator frequency at 30.0 MHz, set RF output level to 1000 microvolts.

Step 51. Adjust variable resistor R10, on the 10.7 MHz IF amplifier module A1A6, counterclockwise until output signal on oscilloscope increases rapidly in amplitude. Adjust R10 clockwise until signal becomes noisy. R10 should then be adjusted to a position between the two extreme conditions.

Step 52. Repeat the procedures in Steps 5 through 16 for the low end of bands 8, 9 and 10. Refer to Table 5-7 for required frequencies and corresponding coil adjustments. Use the HP608C signal generator for frequencies over 60 MHz.

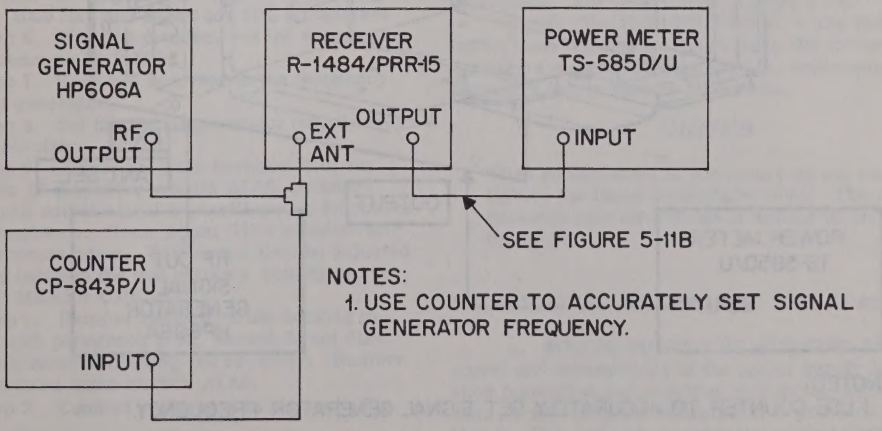


Figure 5-19. Beat Frequency Oscillator Alignment

Step 53. Repeat the procedures in Steps 5 through 16 for the high end of bands 10 through 1. Refer to Table 5-7 for required frequencies and corresponding capacitor trimmer adjustment.

Step 54. Repeat the procedures in Steps 5 through 16 for the low end of bands 1 through 10. Refer to Table 5-7.

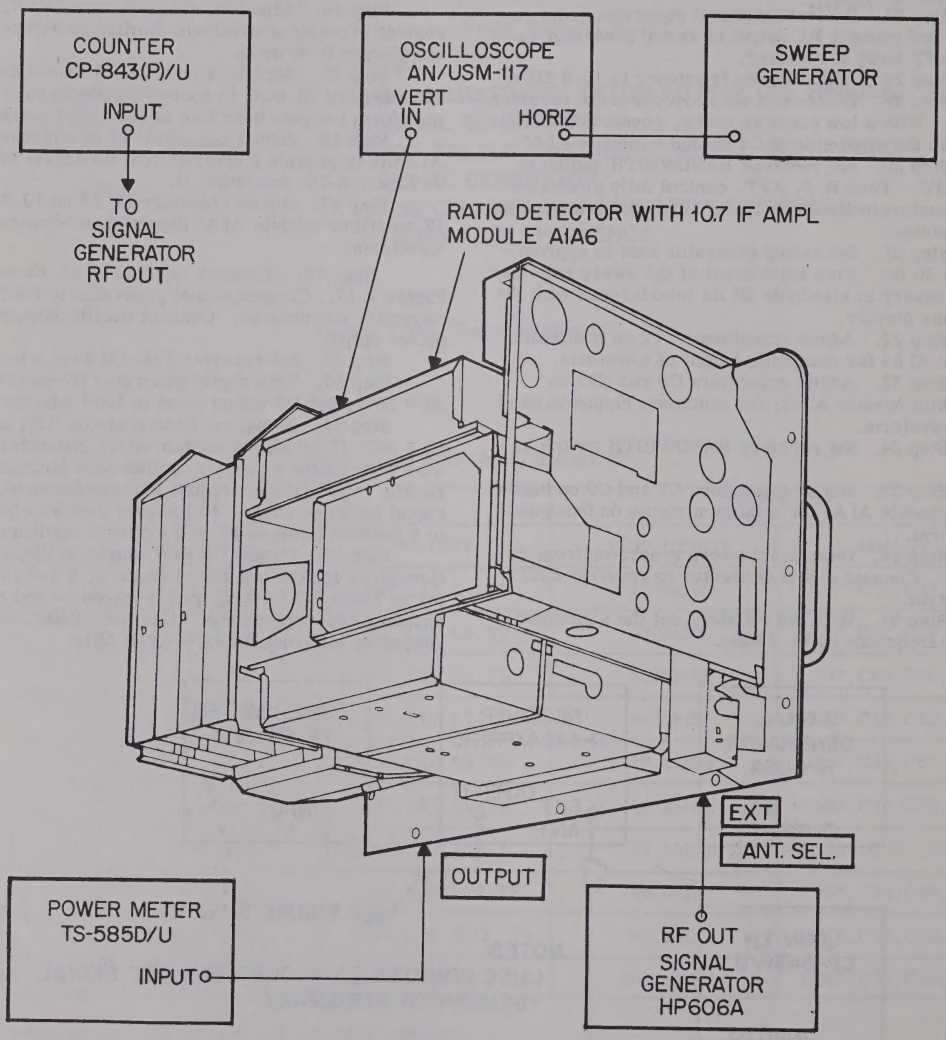
Step 55. Repeat the procedures in Steps 5 through 16 for the high end of bands 10 through 1. Refer to Table 5-7.

Step 56. Disconnect equipment and replace cover shield for audio module A1A8.

Receiver alignment has now been completed and can now be placed into receiver housing and placed into operation.

5-4. ADJUSTMENT.

a. GENERAL. - The electrical adjustments required on the AN/PRR-15 radio receiver are limited to the 455 kHz automatic gain control, 10.7 MHz automatic gain control, and the metering circuit. The dial drive clutch adjustment is the only mechanical adjustment required.



NOTES:
1. USE COUNTER TO ACCURATELY SET SIGNAL GENERATOR FREQUENCY.

Figure 5-20. AGC Adjustment

b. ELECTRICAL ADJUSTMENTS.

(1) 455 KILOHERTZ AGC.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d, except do not disconnect cable between housing and receiver.

Step 2. Connect equipment as shown in Figure 5-18.

Step 3. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

Step 4. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to AGC
VOL control to midrange
BANDWIDTH switch to WIDE
BAND switch to 1
ANT SEL to EXT

Step 5. Set the signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation.

Step 6. With the counter, set the signal generator frequency to 540 kHz.

Step 7. Tune the receiver to the frequency of the signal generator.

Step 8. Set the signal generator output level to 1000 microvolts.

Step 9. Adjust variable resistor R11 on the 455 kHz IF amplifier module A1A5 for a minimum output reading on the power meter.

(2) 10.7 MEGAHERTZ AGC.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d, except do not disconnect cable between housing and receiver.

Step 2. Connect equipment as shown in Figure 5-18.

Step 3. Turn on test equipment and receiver and allow 15 minutes for equipment to warm up.

Step 4. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to AGC
VOL control to midrange
BANDWIDTH switch to WIDE
BAND switch to 7
ANT switch to EXT

Step 5. Set signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation.

Step 6. With the counter, set the signal generator frequency to 15.0 MHz.

Step 7. Tune the receiver to the frequency of the signal generator.

Step 8. Set the signal generator output level to 1000 microvolts.

Step 9. Adjust variable resistor R10, on the 10.7 MHz IF amplifier module A1A6, counterclockwise until output signal on oscilloscope increases rapidly in amplitude. Then adjust R10 clockwise until signal becomes noisy. R10 should then be adjusted to a position between the two extreme conditions.

(3) METER CIRCUIT.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d, except do not disconnect cable between housing and receiver. Remove cover shield from audio module A1A8.

Step 2. Connect equipment as shown in Figure 5-20.

Step 3. Turn on test equipment and receiver and allow 15 minutes to warm up.

Step 4. Set the controls on the front panel of the receiver to the following positions:

FM-AM switch to AM
AGC-OFF switch to AGC
VOL control to midrange
BANDWIDTH to WIDE
BAND switch to 4
ANT switch to EXT

Step 5. Set the signal generator to internal modulation, 1000 Hz, and adjust for 30% modulation.

Step 6. With the counter, set the signal generator frequency to 6000 kHz.

Step 7. Tune the receiver to the frequency of the signal generator.

Step 8. Set the signal generator output level to 1 microvolt.

Step 9. Adjust variable resistor R17, on the audio module A1A8, for a reading of 5 to 10 on the receiver front panel meter.

c. MECHANICAL ADJUSTMENTS.

(1) DIAL DRIVE CLUTCH. - The dial drive clutch provides a means of adjusting and driving the dial tape with respect to the tuner. If the clutch slips during tuning, erroneous tracking of the receiver will result. However, when the PUSH TO CAL brake is applied, the clutch must slip to permit calibration of the tuner. To adjust the dial drive clutch, proceed with the following steps.

Step 1. Remove receiver from housing in accordance with paragraph 5-5d.

Step 2. Using a suitable wrench, hold clutch body on the dial drive shaft stationary as shown in Figure 5-21.

Step 3. To tighten the dial drive clutch, use a suitable wrench and turn nut (item 2) clockwise. To loosen dial drive clutch, turn stop not counterclockwise.

Step 4. Check clutch for proper action. Readjust clutch if necessary.

Step 5. Replace receiver in housing if no other adjustments are to be performed.

(2) INPUT CLUTCH. - The input clutch adjustment is preset at the factory. If excessive clutch slippage occurs, replacement of the input clutch is applicable. For location see Figure 5-28.

(3) PLANETARY DRIVE. - The planetary tuning knob adjustment is preset at the factory. If excessive play or slippage occurs, replacement of the planetary tuning knob is applicable.

CAUTION

When replacement is necessary do not over tighten the three mounting screws. The rubber bushings provide a shock mounting to protect the tuner.

5-5. REMOVAL DISASSEMBLY AND REASSEMBLY.

a. POWER SUPPLY PP-4833/PRR-15. - Removal and disassembly of the power supply is obvious upon inspection and requires no special instructions. Battery replacement information is provided in Section 3. Use care when removing cover to prevent damage to seal.

b. POWER SUPPLY PP-4834/PRR-15.

(1) REMOVAL AND DISASSEMBLY. - Removal and disassembly of the power supply is obvious upon inspection and requires no special instruction except that care should be taken when removing the cover from the power supply to prevent damage to the rubber gasket.

(2) REASSEMBLY. - Replacement of parts within the power supply is obvious upon inspection except that transistor Q5 located on the heat sink must be installed using silicon grease. Coat the transistor, base insulator, and the heat sink with silicon grease and tighten the transistor in place securely. Be sure that the insulator is installed between transistor and heat sink.

c. RECORDER AN/PNH-5. - The disassembly and assembly of the AN/PNH-5 is described in the Service Manual for "Dictet" Recorder (AN/PNH-5). This equipment is government furnished with AN/-PRR-15 and no service information is included in this Service Manual.

d. RECEIVER.

(1) REMOVAL. - Perform the following steps to remove the receiver from the receiver housing.

Step 1. Loosen the ten pan head screws located along the outer edge of the front panel.

Step 2. Grasp handles and slide the receiver directly forward until it just clears the front of the case.

Step 3. Place receiver on flat surface in front of housing.

CAUTION

Do not pull set away from case or power cable at rear of set may be damaged.

Step 4. Remove screw holding connector A2P1 and disconnect connector from A1J12.

(2) DISASSEMBLY AND ASSEMBLY. - The disassembly and assembly of the receiver is described in paragraphs e through q below:

(3) REASSEMBLY. - Reassembly of the receiver to the receiver housing is the revers of the removal procedure paragraph (1) above. Be sure to fasten the ten front panel screws securely to insure a proper seal against the housing gasket.

e. AUDIO ASSEMBLY A1A8.

(1) REMOVAL.

Step 1. Remove receiver from receiver housing as described in paragraph d above.

Step 2. Place receiver upright with tuner toward the right.

Step 3. Loosen the three 4-40 screws on the left support, Figure 5-22, and lift off shield cover.

Step 4. Disconnect A1J9 from P1 and A1J10 from P2.

Step 5. Remove the three 4-40 screws, lockwasher and flatwashers from left receiver support and lift module out of receiver.

(2) DISASSEMBLY. - Disassembly of the audio assembly A1A8 is obvious upon inspection and requires no special procedures.

(3) REASSEMBLY.

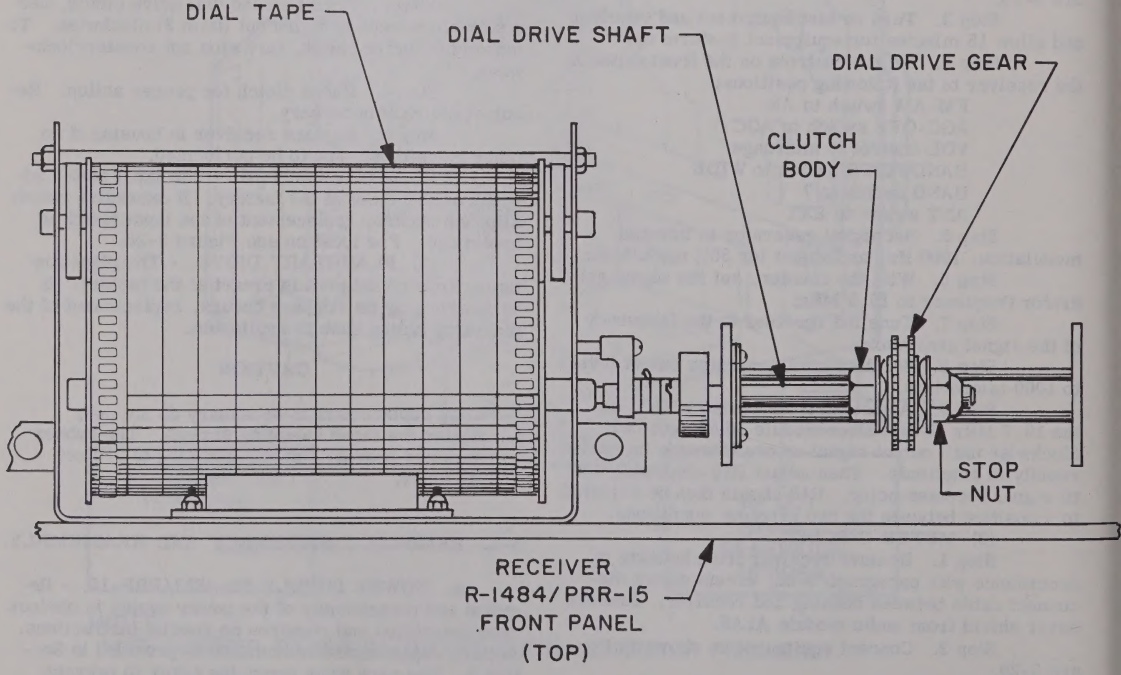


Figure 5-21. Dial Drive Clutch Adjustment

Step 1. Place audio assembly A1A8 in position against left receiver support.

Step 2. Partially fasten the three 4-40 screws in place with the lock washers and flat washers.

Step 3. Connect cable connector A1J9 to P1 and cable connector A1J10 to P2.

Step 4. Place audio assembly shield can in position as shown in Figure 5-22, then tighten the three screws in place.

Step 5. Place receiver in receiver housing as described in paragraph 5-5d.

f. BFO MODULE A1A7.

(1) REMOVAL.

Step 1. Remove receiver from receiver housing as described in paragraph 5-5d.

Step 2. Place receiver upside down on workbench with tuner at the right.

Step 3. Disconnect cable W2 connector P2 from J1, cable W1 from J3, connector A1J8 from P1, and A1A9P2 from J2.

Step 4. Remove two self locking nuts and flat washers from right flange of module.

Step 5. Remove two self-locking nuts; flat washers and a cable clamp from left flange of module.

Step 6. Lift module out of receiver.

(2) DISASSEMBLY.

Step 1. Remove four 2-56 screws, flat washers, and lock washers from top of module.

Step 2. Lift top of module away from bottom section.

Step 3. Remove the four 2-56 screws, lock washers and flat washers from the printed circuit board.

Step 4. Lift printed circuit board off of module frame.

(3) REASSEMBLY.

Step 1. Reinstall printed circuit board into module frame and fasten with the four 2-56 screws, lock washers and flat washers.

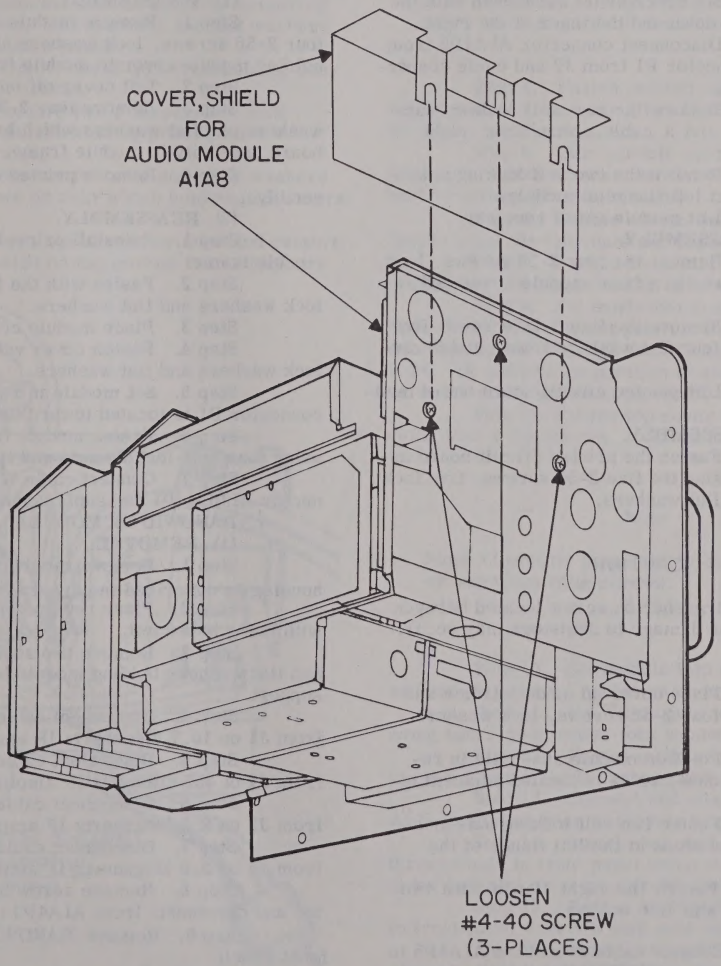


Figure 5-22. Removal of Audio Module A1A8

Step 2. Place module cover in place and fasten with four 2-56 screws, lock washers and flat washers.

Step 3. Set BFO module in position on the receiver so that P1 is toward the left.

Step 4. Fasten left flange of module to receiver using the two self-locking nuts and flat washers. Be sure to place cable clamp on stud closest front panel before fastening nut in place.

Step 5. Fasten right flange of module to receiver using two self locking nuts and lock washers.

Step 6. Reconnect cable W2, connector P2 to J1, cable W1 to J3, connector A1J8 to P1, and connector A1A9P2 to J2.

g. 10.7 MEGAHERTZ IF AMPLIFIER MODULE A1A6.

(1) REMOVAL.

Step 1. Remove receiver from receiver housing as described in paragraph 5-5d.

Step 2. Set receiver on workbench with the front panel facing down and the tuner at the right.

Step 3. Disconnect connector A1A4P5 from J1, cable W2 connector P1 from J2 and cable connector A1J7 from P1.

Step 4. Remove the two self locking nuts and flat washers and a cable clamp from right flange of module.

Step 5. Remove the two self locking nuts and flat washers at left flange of module.

Step 6. Lift module out of receiver.

(2) DISASSEMBLY.

Step 1. Remove the four 2-56 screws, lock washers and flat washers from module cover and remove cover.

Step 2. Remove the five 2-56 screws, five lock washers and four flat washers from printed circuit board.

Step 3. Lift printed circuit board out of module frame.

(3) REASSEMBLY.

Step 1. Fasten the printed circuit board assembly in place using the five 2-56 screws, five lock washers and four flat washers.

CAUTION

Do not use flat washer on screw located between R18 and R40 or damage to resistors may occur.

Step 2. Place cover on module frame and fasten cover with four 2-56 screws, lock washers and flat washers.

Step 3. Position module assembly in receiver such that connector J1 is located adjacent to the tuner module.

Step 4. Fasten two self locking nuts and flat washers on the studs at the left flange of the module.

Step 5. Fasten the right flange with two self locking nuts and flat washers.

Step 6. Connect cable connector A1A4P5 to J1, cable W2 connector P1 to J2 and cable connector A1J7 to P1.

Note

A cable clamp should be fastened with the self locking nut located in the upper right corner of the module.

h. 455 KILOHERTZ IF AMPLIFIER MODULE A1A5.

(1) REMOVAL.

Step 1. Remove receiver from receiver housing as described in paragraph 5-5d.

Step 2. Set receiver upside down on workbench with tuner at the right.

Step 3. Disconnect cable W1 from J2, cable connector A1A4P4 from J1 and connector A1J6 from P1.

Step 4. Remove four self locking nuts and flat washers holding the module flanges to the receiver.

Step 5. Remove module from receiver.

(2) DISASSEMBLY.

Step 1. Remove module cover by removing four 2-56 screws, lock washers and flat washers holding module cover to module frame.

Step 2. Lift cover off module.

Step 3. Remove four 2-56 screws lock washers and flat washers which hold printed circuit board assembly to module frame.

Step 4. Remove printed circuit board assembly.

(3) REASSEMBLY.

Step 1. Reinstall printed circuit board into module frame.

Step 2. Fasten with the four 2-56 screws, lock washers and flat washers.

Step 3. Place module cover on module.

Step 4. Fasten cover with four 2-56 screws, lock washers and flat washers.

Step 5. Set module in receiver such that connector P1 is located toward tuner module.

Step 6. Fasten module to receiver studs using four self-locking nuts and flat washers.

Step 7. Connect cable W1 to J2 cable connector A1J6 to P1 and cable connector A1A4P4 to J1.

i. BANDWIDTH MODULE A1A4.

(1) REMOVAL.

Step 1. Remove receiver from receiver housing as described in paragraph 5-5d.

Step 2. Place receiver in upright position with tuner to the left.

Step 3. Remove two screws, lock washers and flat washers holding module to right receiver support.

Step 4. Disconnect cable connector A1A4P5 from J1 on 10.7 Megahertz IF amplifier module A1A6.

Step 5. Disconnect cable connector A1A4P4 from J1 of 455 kilohertz IF amplifier module A1A5.

Step 6. Disconnect cable connector A1A4P2 from J3 on 2.9 Megahertz IF amplifier module A1A3.

Step 7. Disconnect cable connector A1A4P1 from J2 on 2.9 Megahertz IF amplifier module A1A3.

Step 8. Remove screw holding A1J5 connector and disconnect from A1A4P3 connector.

Step 9. Remove BANDWIDTH knob from front panel.

Step 10. Remove 3/8 inch seal nut holding bandwidth shaft to front panel.

Step 11. Slide bandwidth shaft and detent assembly toward bandwidth module to point where shaft is clear of front panel.

Step 12. Remove two screws, lock washers and flat washers from receiver center support holding bandwidth module.

Step 13. Remove bandwidth module from receiver.

Note

Be sure all cables from the bandwidth module are clear before lifting module out of the receiver.

(2) DISASSEMBLY.

Step 1. Remove bandwidth shaft and detent assembly from module.

Step 2. Remove module cover by removing the five 2-56 screws, lock washers and flat washers holding cover to module frame.

Step 3. Remove the 2-56 screw holding connector P3 to module frame.

Step 4. Remove two 2-56 screws, lock washers and flat washers holding printed circuit board to module frame.

Step 5. Remove two nuts and plain washers on front and two nuts on rear which hold switch wafers to module frame.

Step 6. Turn module frame over and remove the 2-56 screw located on the module frame bottom

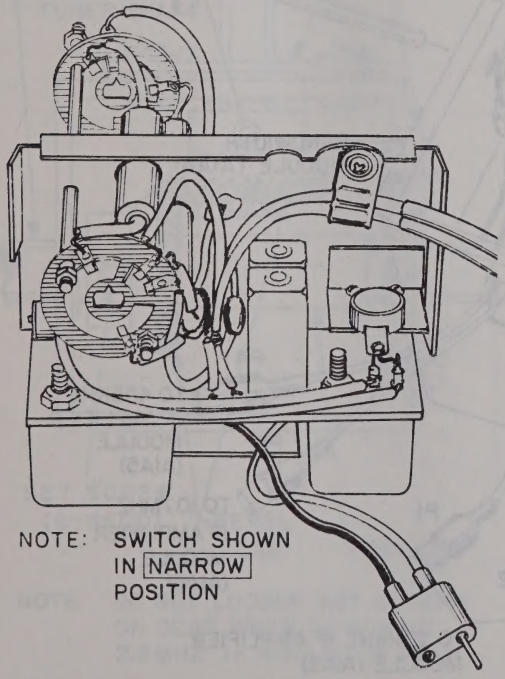


Figure 5-23. Bandwidth Module A1A4 Wafer Alignment

Step 7. Turn module over then slightly bend module side out at top to allow printed circuit board assembly to be removed.

Step 8. Lift printed circuit board assembly by center bracket and remove from module frame taking care not to damage the four coaxial cables and the 2-wire power cable which must be pushed through the holes provided in the module frame.

(3) REASSEMBLY.

Step 1. Align wafers as shown in Figure 5-23.

Step 2. Insert cables connectors through openings in module frame as shown in Figure 5-24.

Step 3. Lower printed circuit board assembly into module frame and pull cables through opening as required.

Note

It is necessary to slightly bend module frame sides to clear printed circuit board.

Step 4. Fasten printed circuit board assembly to module frame using two 2-56 screws, lock washers, and flat washers.

Step 5. Turn module over and insert 2-56 screw, with lock washer and flat washer through hold in bottom of module frame.

Step 6. Fasten switch wafers to module frame using the four nuts and plain washers.

Step 7. Fasten connector P3 to module frame stud closest to center of module.

Step 8. Set bandwidth module shaft to the counterclockwise detent position then insert shaft and detent assembly through module as shown in Figure 5-24. Do not change position of shaft while inserting or wafer misalignment can occur.

Step 9. Fasten top cover to module frame using four 2-56 screws, lock washers and flat washers.

Note

Sides of module may have to be pressed together when inserting screws.

Step 10. Set module into receiver and route and connect coaxial cables as shown in Figure 5-24.

Step 11. Fasten module to center support using two 2-56 screws, lock washers and flat washers.

Step 12. Fasten module to right support using two screws, lock washers and flat washers.

Step 13. Connect and mount cable connector A1J5 to stud on rear of module using a 2-56 screw.

Step 14. Insert shaft and detent assembly through hole in front panel being sure to insert detent index into slot on rear of front panel.

Step 15. Fasten shaft and detent assembly to front panel with 3/8 inch seal nut.

Step 16. Place bandwidth knob on shaft and align pointer with NARROW position index line then tighten set screws.

j. 2.9 MEGAHERTZ IF AMPLIFIER A1A3.

(1) REMOVAL.

Step 1. Remove receiver from receiver housing as described in paragraph 5-5d.

Step 2. Set receiver on front panel with tuner module to the left.

Step 3. Remove connector retainer which holds connectors A1A3P4 and A1A3P3 in place.

Step 4. Remove cable clamp on left support and disconnect cable connector A1A3P4 from front panel connector J11, and cable connector A1A3P3 from front panel connector J9.

Step 5. Remove 2-56 screw holding cable connector A1A3P5 and disconnect from A1A1P3. These connectors are located on lower rear of receiver.

Step 6. At end of module near gear box, disconnect cable connector P4 from J1, cable connector A1A4P2 from J3 and cable connector A1A4P1 from J2.

Step 7. Disconnect cable connector A1J3 from P1 and cable connector A1J4 from P2.

Step 8. On tuner shaft, loosen two set screws on bevel gear, Figure 5-25.

Step 9. Slide fiberglass shaft toward tuner module far enough to clear 2.9 Megahertz IF amplifier module but do not slide beyond bearing retainer on gear box.

Step 10. Remove two 4-40 screws, lock washers and flat washers holding module bracket to receiver.

Note

These screws are located under gear box assembly and are removed from bottom of receiver.

Step 11. Remove four 4-40 screws, lock washers and flat washers, from left support.

Step 12. Carefully lift module out of receiver taking care not to damage exposed switch wafer.

(2) DISASSEMBLY.

Step 1. Remove module top cover by removing the two 2-56 screws, lock washers, and flat washers holding the cover to the module frame then lift cover off.

Step 2. Remove the three 2-56 screws, lock washers and flat washers from one side of module frame and the four 2-56 screws, lock washers and flat washers from the opposite side of the module frame.

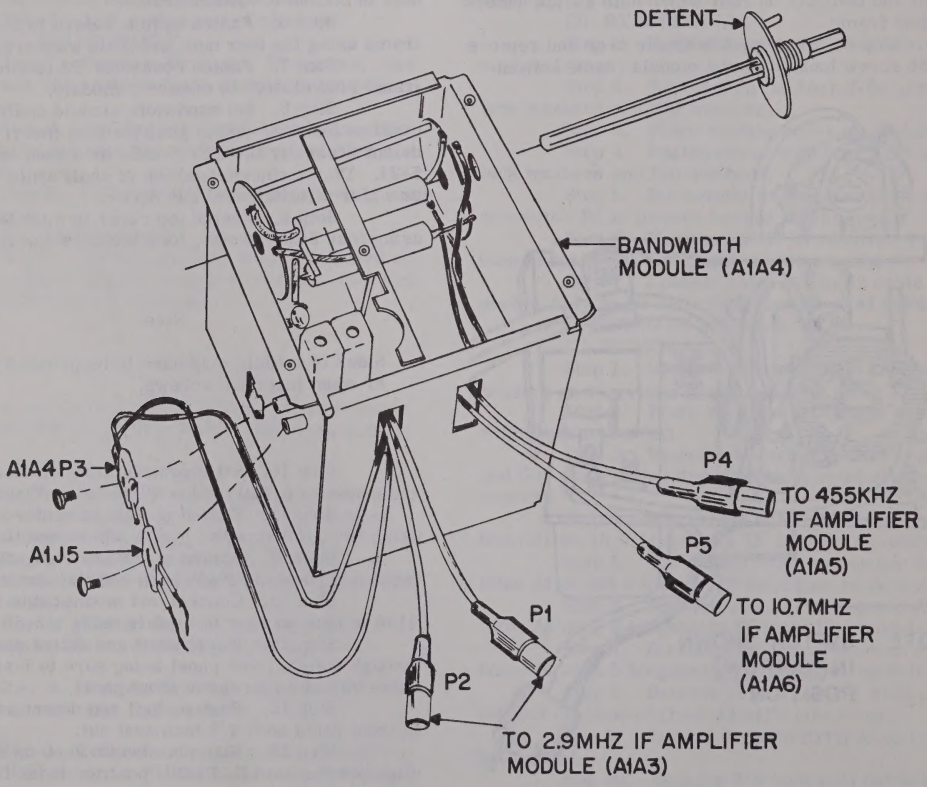


Figure 5-24. Bandwidth Module A1A4 Assembly

Step 3. Remove the three 2-56 screws, lock washers and flat washers holding printed circuit board to module frame.

Step 4. Remove printed circuit board assembly from module frame.

(3) REASSEMBLY.

Step 1. Align switch wafers on the printed circuit board so that "v" notches on each rotor shaft opening are in line with each other.

Note

Check that all internal wafers are positioned such that the "v" notch of each wafer is as shown in Figure 5-26C. This will place the "v" notch toward the rear of the receiver when the module is installed in the receiver. The "outrigger" wafer on the 2.9 should be oriented as shown in Figure 5-26B. Disregard the "v" notch on this wafer. Some units will have the "v" notch in opposite directions. Alignment should be made with reference to the wafer blade orientation as shown in figure 5-26B.

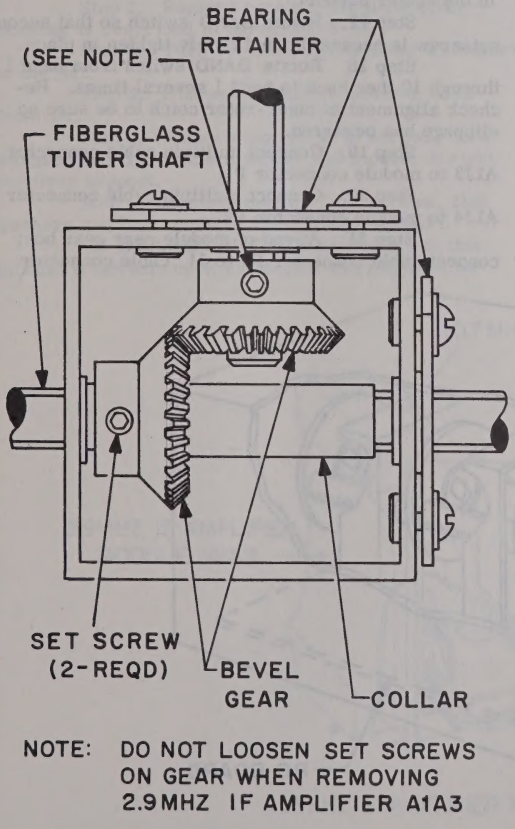


Figure 5-25. Bandwidth Gear Alignment

Step 2. Set printed circuit board into module frame so that connectors P1 and P2 are positioned adjacent to the long slot in the module frame.

Step 3. Reinstall printed circuit board into module frame and fasten with the three 2-56 screws, lock washers anf flat washers.

Step 4. Fasten printed circuit board shields to side of module frame using seven 2-56 screws, lock washers and flat washers.

Step 5. Fasten module cover to module frame using two 2-56 screws, lock washers and flat washers.

Step 6. Slide module into place in the receiver such that module cover is toward front panel and the "outrigger" switch is toward the outer support bracket of receiver.

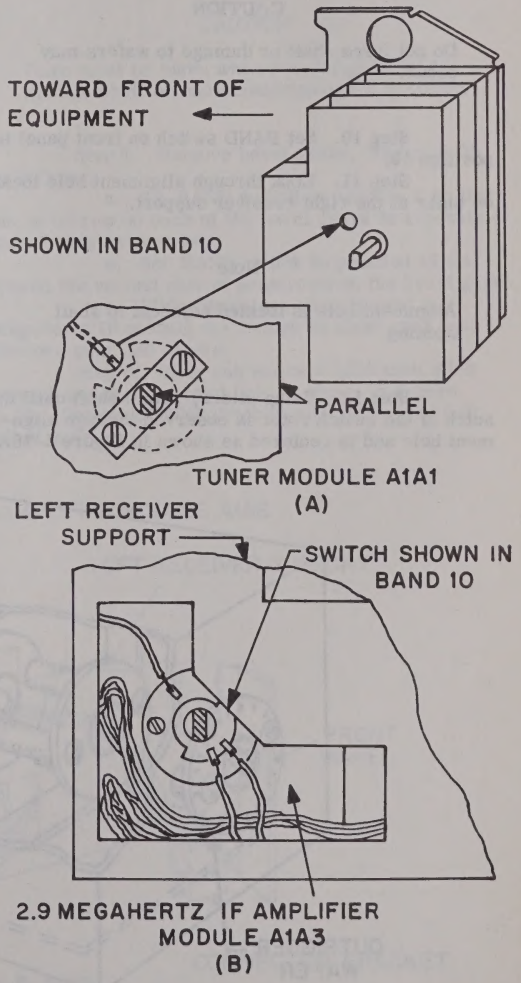


Figure 5-26. Wafer Alignment for Tuner and 2.9 MHz IF Amplifier

Note

Be sure A1J3, A1J4, A1A3P4 and A1A3P3 connectors are through clearance hole in left support.

Step 7. Fasten the module to the receiver support with four 4-40 screws, lock washers and flat washers.

Step 8. Fasten angle bracket to receiver support flange located under gear box using 4-40 screws. Screws are inserted from bottom of receiver.

Step 9. Carefully slide fiberglass shaft extending out of tuner module through the 2.9 Megahertz module.

CAUTION

Do not force shaft or damage to wafers may occur.

Step 10. Set BAND switch on front panel to position 10.

Step 11. Look through alignment hole located on tuner at the right receiver support.

Note

Alignment hole is located adjacent to shaft opening.

Step 12. Using pliers, rotate shaft until the notch of the switch rotor is observed through alignment hole and is centered as shown in Figure 5-26A. Care should be taken to avoid burring the shaft.

Step 13. Check position of rotor on "outrigger" switch wafer of 2.9 Megahertz module. Wafer should be as shown in Figure 5-26B.

Note

It is possible for rotor to be misaligned by 180°. If this occurs, slide shaft completely out of 2.9 Megahertz IF amplifier module, rotate 180 degrees, then slide shaft back through module. Again align tuner rotor through alignment hole as in Step 12 above. Recheck 2.9 Megahertz IF amplifier module wafer. It should now be properly oriented as shown in Figure 5-26B.

Step 14. Again check that tuner module rotor notch is exactly centered, see Step 12.

Step 15. Position bevel gear in gear box such that setscrew can be accessed through opening in gear box.

Step 16. Hold bevel gears together then firmly tighten setscrew against shaft collar. Metal bevel gear collar should rest against bearing located in the center support.

Step 17. Rotate BAND switch so that second setscrew is accessible and firmly tighten in place.

Step 18. Rotate BAND switch from band 1 through 10 then back to band 1 several times. Recheck alignment of tuner-rotor notch to be sure no slippage has occurred.

Step 19. Connect multipin cable connector A1J3 to module connector P1.

Step 20. Connect multipin cable connector A1J4 to module connector P2.

Step 21. At end of module near gear box, connect cable connector P4 to J1, cable connector

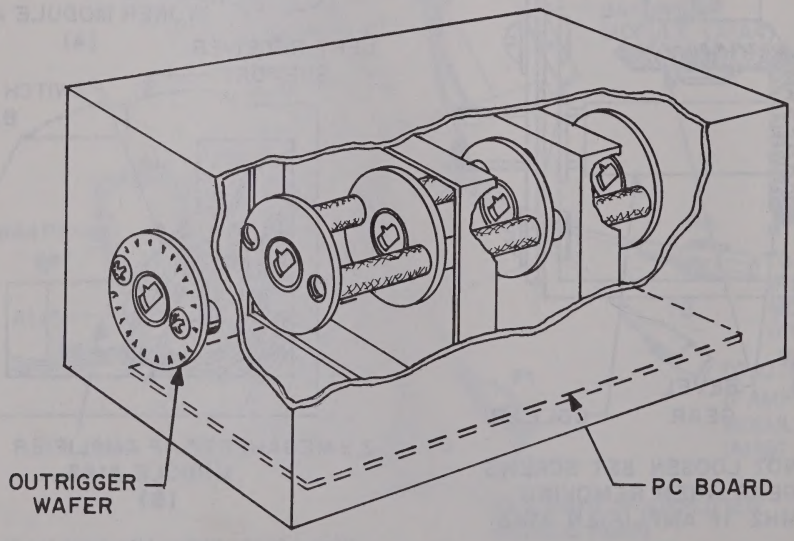


Figure 5-26C. Wafer Alignment for Tuner and 2.9 MHz IF Amplifier

A1A4P2 to J3 and cable connector A1A4P1 to J2.

Step 22. Connect the module coaxial cable connectors A1A3P3 and A1A3P4 to J9 and J11 respectively on the front panel bracket.

Step 23. Using screw, flat washer and lock washer reinstall connector retainer over the connector bracket containing connectors J9 and J11. See Figure 5-27.

Note

The connector bracket contains four connectors and is located near the antenna terminals.

Step 24. Reinstall cable clamp on left support.

Step 25. Connect 2-pin connector A1A3P5 to A1A1P3 which is mounted on stud under receiver at outer support.

Step 26. Fasten cables to outer support with cable clamps as shown in Figure 5-27.

Step 27. Reassemble receiver to receiver case in accordance with paragraph 5-5d above.

k. FREQUENCY CALIBRATOR A1A2.

(1) REMOVAL.

Step 1. Remove receiver from receiver housing as described in paragraph 5-5d.

Step 2. Turn receiver upside down with tuner to the left.

Step 3. Disconnect cable connector A1J2 from P1.

Step 4. Remove the two 4-40 screws, lock washers and flat washers which hold module to right receiver support.

Step 5. Remove the two 2-56 screws, flat washers and lock washers from center support.

(2) DISASSEMBLY. - Disassembly of this module is obvious upon inspection and requires no special procedures.

(3) REASSEMBLY. - Reassembly is the reverse of the disassembly procedure.

l. TUNER A1A1.

(1) REMOVAL.

Step 1. Remove receiver from receiver housing as described in paragraph 5-5d.

Step 2. Remove frequency calibrator module A1A2 as described in paragraph k above.

Step 3. Remove 10.7 MHz IF amplifier module A1A6 as described in paragraph g above.

Step 4. Remove 455 kHz IF amplifier module A1A5 as described in paragraph h above.

Step 5. Remove BFO module A1A7 as described in paragraph f above.

Step 6. Remove bandwidth module A1A4 as described in paragraph i above.

CAUTION

Care must be taken when removing the A1A4 module shaft or equipment damage may occur.

Step 7. Remove bevel gears, Figure 5-25, as follows:

a. Set BAND switch to position 6 so that one setscrew on each of the bevel gears is accessible then loosen setscrews.

b. Set BAND switch to position 10 and loosen the second pair of setscrews on the bevel gears.

c. Slide fiberglass shaft toward 2.9 Megahertz IF module far enough to clear gear box. Remove gear and sleeve.

Step 8. Slide one end of a 1/16 inch allen wrench under drive (pic) belt as shown in Figure 5-28. Rotate TUNING knob to slip drive (pic) belt off of gear.

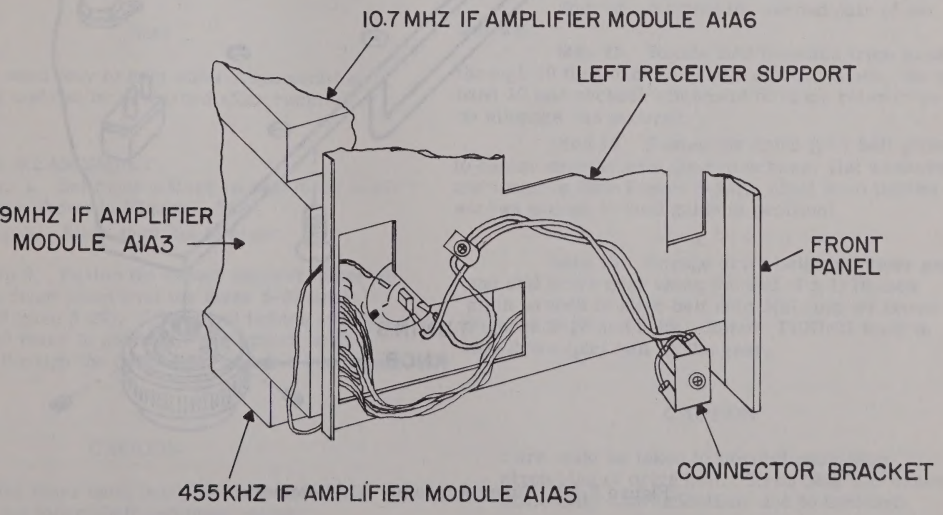


Figure 5-27. Cable Routing for 2.9 MHz IF Amplifier Module A1A3

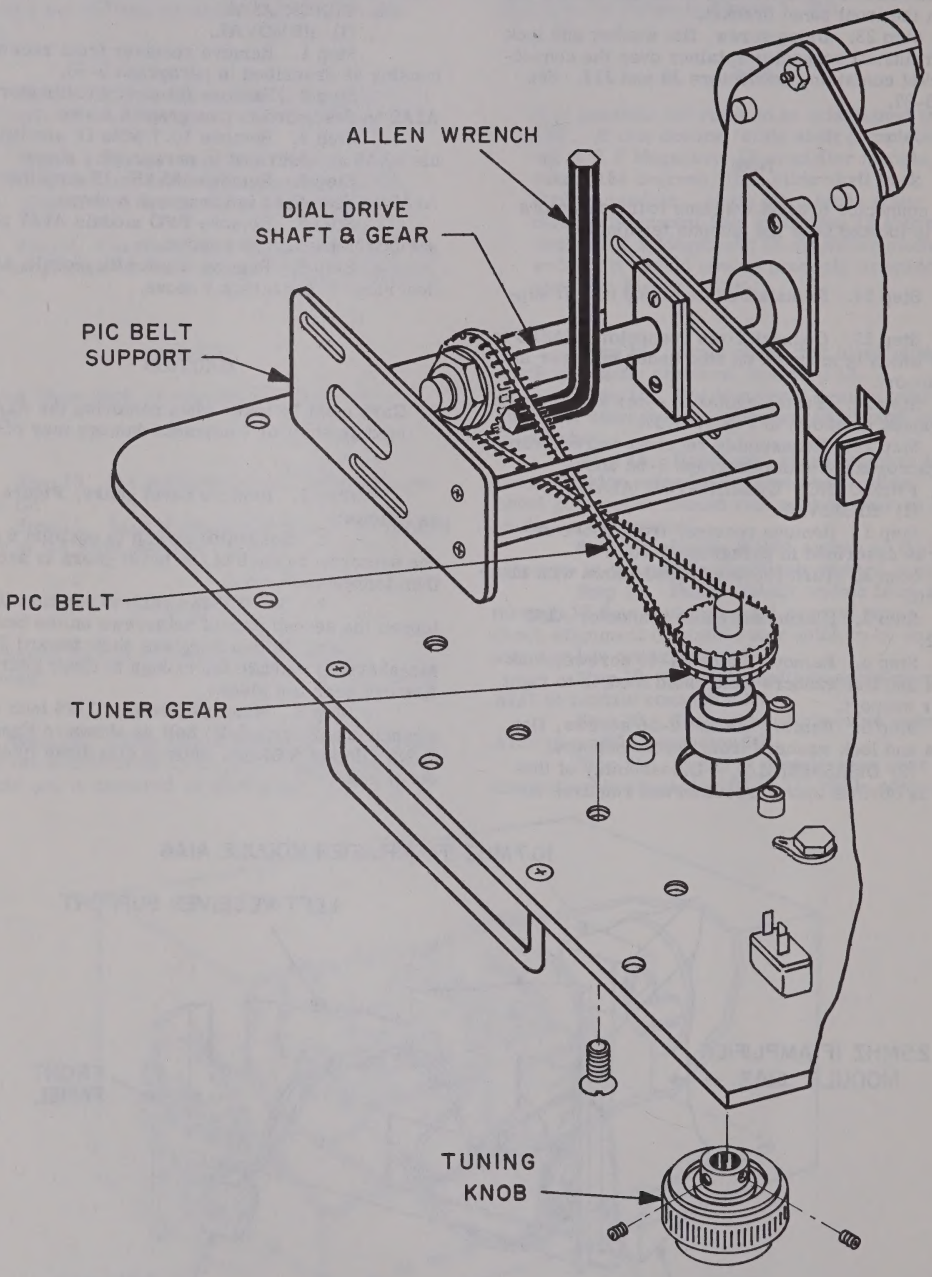


Figure 5-28. Tuner Assembly A1A1 Removal

CAUTION

Care must be taken to prevent excess stretching of drive belt. Stretching will cause inaccurate dial indications due to backlash.

Step 9. Remove two screws, flat washers, nd locknuts which hold the drive belt guide to right nd center supports (see Figure 5-29).

Step 10. Loosen the two setscrews on the nput clutch (see Figure 5-28).

Step 11. Remove screw which holds plastic able clamp to center support.

Step 12. Disconnect A1A1P1 from A1J1.

Step 13. Disconnect A1A1P4 from A1A3J1.

Step 14. Disconnect A1A1P2 from A1A9J9.

Step 15. Disconnect A1A1P3 from A1A3P5.

Step 16. Remove the seven screws from the ront panel which hold the right and center (tuner attached) receiver supports to the front panel (see 'igure 5-29).

CAUTION

When removing front panel screws, use proper Phillips head screw driver to prevent stripping of screw slot.

Step 17. Remove the eight 2-56 screws, lat washers, and lock washers which hold the right upport to the tuner.

(2) DISASSEMBLY.

CAUTION

Do not attempt disassembly of tuner module. The tuner is replaced as a complete assembly.

Note

Shaft is used only to hold wafer alignment for shipping and can be discarded after removal.

(3) REASSEMBLY.

Step 1. Set tuner wafers on new tuner module to position shown in Figure 5-26A.

Step 2. Slide shaft out of tuner.

Step 3. Fasten the center support (tuner attached) to the front panel with the three 6-32 seal crews (see Figure 5-29). (Just hand tighten screws ough to hold tuner in position). The tuner shaft st be slid through the drive (pic) belt and into input tch.

CAUTION

When fitting tuner back into place, be careful when mating tuner shaft and input clutch.

Step 4. Set BAND switch on front panel to position 10.

Step 5. Look through shaft hole located on tuner at the right side receiver support as shown in Figure 5-26A and check that all "V" notches on wafer are in line.

Note

Alignment hole is located adjacent to shaft opening.

Step 6. Mount sleeve and gear loosely on shaft and slide into tuner.

Step 7. Rotate shaft until the notch of the switch blade is observed through alignment hole and is centered as shown in Figure 5-26A.

Step 8. Check position of rotor on "outrigger" switch wafer of 2.9 Megahertz module. Wafer should be as shown in Figure 5-26B.

Note

It is possible for rotor to be misaligned by 180 degrees. If this occurs, slide shaft completely out of 2.9 Megahertz IF amplifier module, rotate 180 degrees, and then slide the shaft back through module. Again align tuner rotor through alignment hole as in Step 7 above. Recheck 2.9 Megahertz IF amplifier module wafer. It should now be properly oriented.

Step 9. Position bevel gears in gear box as shown in Figure 5-25.

Step 10. Hold bevel gears together and firmly tighten setscrews against shaft collar (See figure 5-25).

Step 11. Set BAND switch to position 6.

Step 12. Tighten the second pair of set screws.

Step 13. Rotate BAND switch from band 1 through 10 then back to band 1 several times. Set to band 10 and recheck alignment of tuner rotor to be sure no slippage has occured.

Step 14. Fasten the drive (pic) belt guide to center support with the two screws, flat washers, and locknuts (See Figure 5-29). (Just hand tighten screws enough to hold guide in position).

Step 15. Engage drive belt onto tuner gear and dial drive gear using the end of a 1/16 inch allen wrench to slide belt onto dial gear as shown in Figures 5-28 and 5-29. Rotate TUNING knob to slip drive (pic) belt on the gear.

CAUTION

Care must be taken to prevent excessive stretching of drive belt. Stretching will cause inaccurate dial indications due to backlash.

Note

When drive (pic) belt is put on properly, the frequency readings will increase as the TUNING knob is rotated in a clockwise position.

Step 16. Fasten right support to front panel using the four 6-32 seal screws. (Just hand tighten screws enough to hold support in position).

Step 17. Fasten tuner to right support using eight 2-56 screws, lock washers, and flat washers.

Step 18. Fasten the drive (pic) belt guide to right support with the two screws, flat washers, and locknuts (See Figure 5-29). Hand tighten screws enough to hold guide securely. See note in Step 15.

Step 19. Fasten the center and right receiver supports to the front panel securely using the seven 6-32 seal screws.

Step 20. Fasten the two setscrews securely on input clutch using a 1/16 allen wrench.

Step 21. Check proper mating of tuner shaft and input clutch.

Note

When there is proper mating of tuner shaft and input clutch, the TUNING knob will rotate freely without binding.

Step 22. Fasten the drive (pic) belt guide securely to center and right supports with the four screws, flat washers, and locknuts. Holding belt guides toward top of receiver.

CAUTION

Be careful when securing the guide to the supports. Keep dial drive shaft clear of guide support. First hand tighten the four screws and rotate TUNING knob to check clearance. If no binding is felt as TUNING knob is rotated, tighten the four screws securely and check clearance again. Repeat if necessary.

Step 23. Connect A1A1P3 to A1A3P5.

Step 24. Connect A1A1P2 to A1A9J9.

Step 25. Connect A1A1P4 to A1A3J1.

Step 26. Connect A1A1P1 to A1J1.

Step 27. Fasten the plastic cable clamp to center support.

Step 28. Replace bandwidth module A1A4 as described in paragraph i (Steps 10 through 16 of reassembly procedure) above.

Step 29. Replace BFO module A1A7 as described in paragraph f (Steps 3 through 6 of reassembly procedure) above.

Step 30. Replace 455 kHz IF amplifier module A1A5 as described in paragraph h (Steps 5 through 7 of reassembly procedure) above.

Step 31. Replace 10.7 MHz IF amplifier module A1A6 as described in paragraph g (Steps 3 through 5 of reassembly procedure) above.

Step 32. Replace frequency calibrator module A1A2 in the reverse of the removal procedure as described in paragraph k above.

Step 33. Replace receiver in receiver housing in the reverse of the removal procedure as described in paragraph d above.

m. DIAL DRIVE ASSEMBLY (See Figure 5-30).

(1) REMOVAL.

Step 1. Remove receiver from receiver housing as described in paragraph 5-50.

Step 2. Remove the 10.7 MHz IF amplifier module A1A6 as described in paragraph 5-5g.

Step 3. Remove the audio module A1A8 as described in paragraph 5-5e.

Step 4. Remove the bandwidth module A1A4 as described in paragraph 5-5i.

Step 5. Loosen bevel gear on BAND switch shaft (2 setscrews).

Step 6. Slip drive belt off of drive clutch using an allen wrench as shown in Figure 5-28.

Note

Slide belt toward end of shaft.

Step 7. Remove drive clutch from shaft.

Step 8. Remove belt guides and bearing retainer on center and left support.

Step 9. Remove right support.

Step 10. Loosen brake drum and slide toward dial drum; then tighten brake drum to dial drive shaft.

Step 11. Loosen large bevel gear on BAND switch shaft.

Step 12. Hold finger against spindle to prevent rotation; then slide large bevel gear toward rear of receiver, disengaging the two nylon bevel gears.

Step 13. Slowly remove finger from spindle to allow shutter to move slowly toward the left edge of the dial drive assembly.

CAUTION

Shutter and/or spindles may be permanently damaged if shutter is allowed to snap to the left.

Step 14. Loosen eleven flathead screws on front panel which hold the front panel to receiver frame.

Step 15. Remove four 4-40 screws including cable clamp which secures dial drum to front panel.

Step 16. Lift out dial drum being sure drive belt is free of shaft.

(2) DISASSEMBLY. - The dial drive assembly shall be replaced as complete assembly at Field level. At Depot level further breakdown can be accomplished in accordance with the following procedure

Step 1. Loosen two setscrews on dial drive clutch.

Step 2. Loosen two setscrews securing dog washer catch to dial drive shaft.

Step 3. Slide dog washers and dog washer catch off of dial drive shaft.

Step 4. Wind dial tape in one direction until end of tape is reached.

Step 5. Hold rollers in place and carefully remove the dial tape which is glued to roller.

CAUTION

Do not allow rollers to spin freely as serious irreparable damage to spring mechanism will result.

Step 6. Slowly allow rollers to unwind.

Step 7. Remove self-locking nut on each end of the spacer screw and remove spacer screw and shims from dial drum bracket assembly.

Step 8. Spread dial drum bracket and shutter assembly apart, far enough to remove rollers out of assembly.

Step 9. Remove shutter tape by unwinding the shutter tape take-up spindles and carefully removing the shutter tape which is glued to spindles.

Note

Do not perform any further disassembly or special fixture will be required to reassemble.

(3) REASSEMBLY.

Step 1. Spread dial drum bracket and shutter assembly apart, far enough to insert rollers. The guide pin on the end of each roller must be inserted in guide pinhole on the dial drum bracket and shutter assembly.

Step 2. Replace spacer screw and shims on dial drum bracket and shutter assembly and secure with self-locking nuts.

Step 3. Preload upper roller 19 turns, as shown by arrow in Figure 5-30 B.

Step 4. Apply pliobond adhesive to end of dial tape and to roller. Hold tape to roller with masking tape until pliobond adhesive dries.

Step 5. Repeat Steps 7 and 8 for lower roller.

Step 6. Preload shutter tape takeup spindle 8 turns in a clockwise direction when viewed from the spring side of the spindle.

Step 7. Apply pliobond adhesive to end of shutter tape and spindle. Hold shutter tape to spindle with masking tape until pliobond adhesive dries.

Step 8. Apply pliobond adhesive to other end of shutter tape and to other shutter spindle. Hold shutter tape to spindle with masking tape until pliobond adhesive dries.

Step 9. Install dog washer catch and dog washers as shown in Figure 5-30.

Step 10. Rotate dial tape toward the high-number end until it is approximately 1-1/2 to 2 inches past the end of the tape as seen through the shutter tape window.

Step 11. Secure dog washer catch to dial drive shaft by tightening the two setscrews.

Step 12. Lower dial drive assembly into the receiver. Align the mounting holes of the dial drive assembly over the studs on the back of the front panel.

CAUTION

Be sure shutter tape is not damaged when placing new dial drum over studs.

Step 13. Position the dial light bracket and cable clamp over the two studs near the top of the front panel.

Step 14. Secure the dial drive assembly to the receiver using four self-locking nuts.

Step 15. Set BAND switch to BAND 5 then rotate right shutter spindle to move shutter across dial until BAND 5 is centered in window.

Step 16. Engage the large gear on the band selector shaft with the small gear on the shutter tape spindle.

Step 17. Secure the large gear to the band selector shaft by tightening the two setscrews.

Note

After tightening one setscrew, rotate BAND switch to obtain access to second setscrew.

Step 18. Fasten belt guide and bearing retainers on center and left support.

Step 19. Attach drive clutch.

Step 20. Slide drive belt onto drive clutch in rockets.

Step 21. Fasten bevel gear on BAND switch shaft (2 setscrews).

Step 22. Replace assemblies A1A4, A1A6, and A1A8 in accordance with paragraphs 5-5i, 5-5g, and 5-5e, respectively.

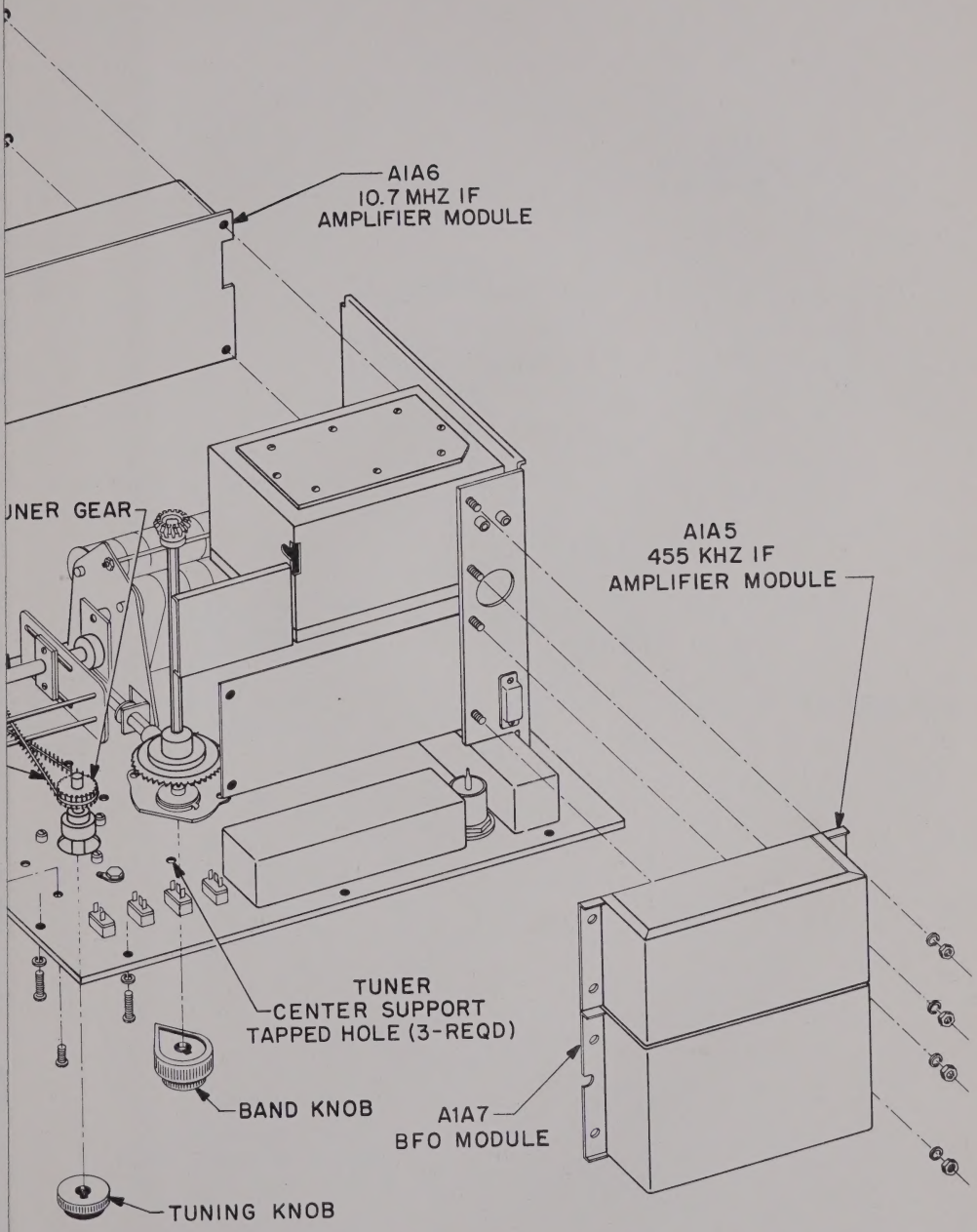


Figure 5-29. Removal and Reassembly of Tuner A1A1.

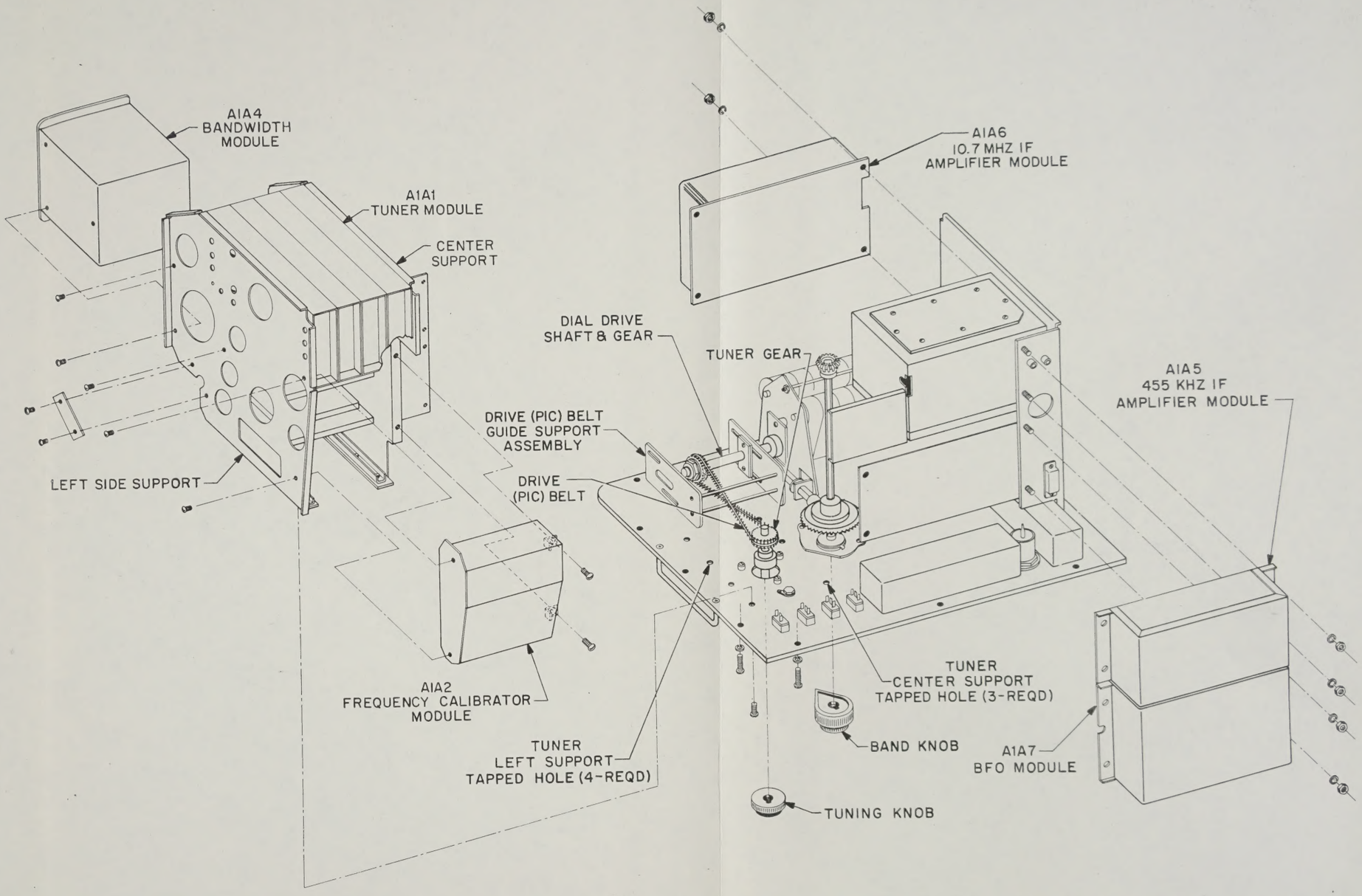


Figure 5-29. Removal and Reassembly of Tuner A1A1.

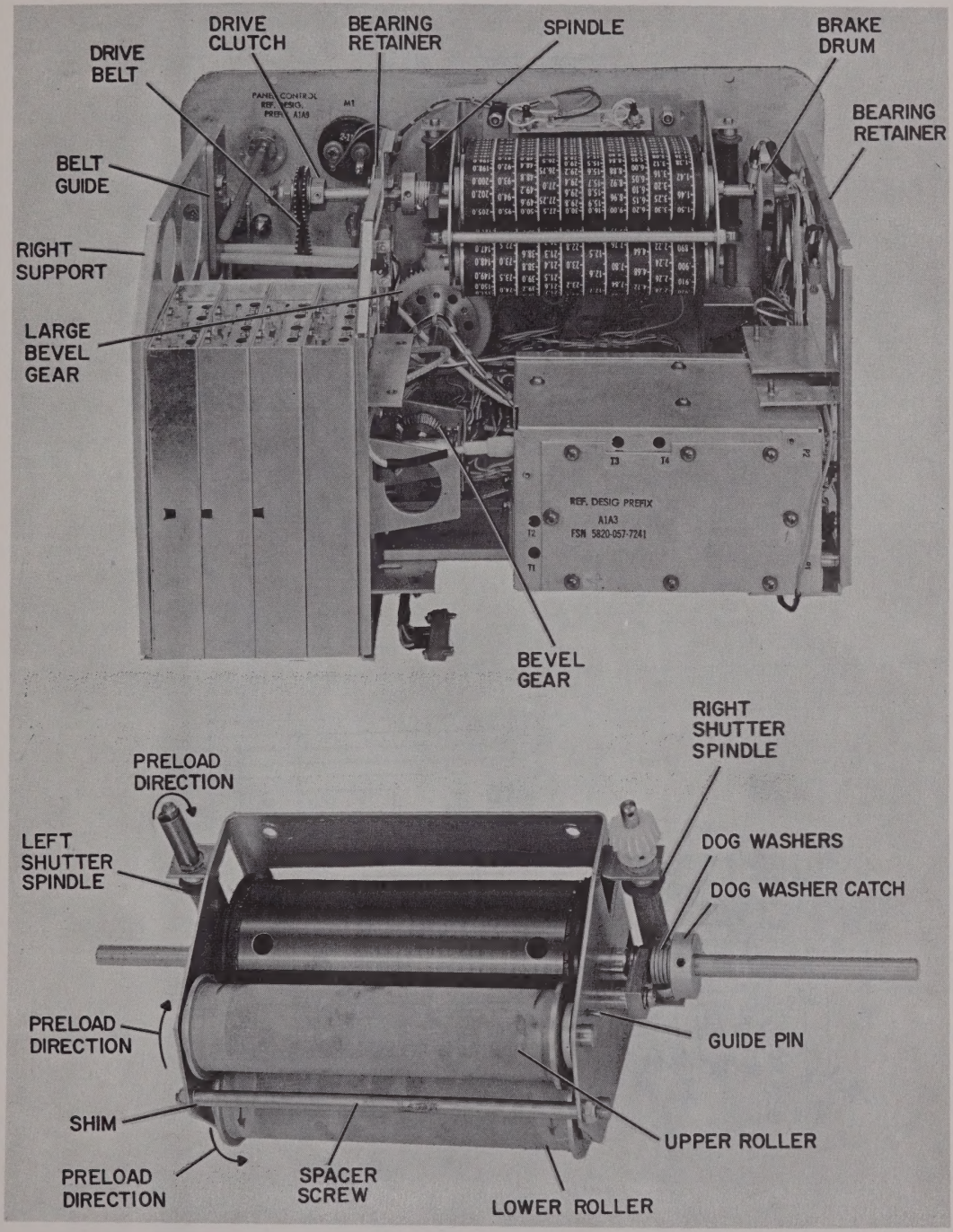


Figure 5-30. Dial Drive Assembly

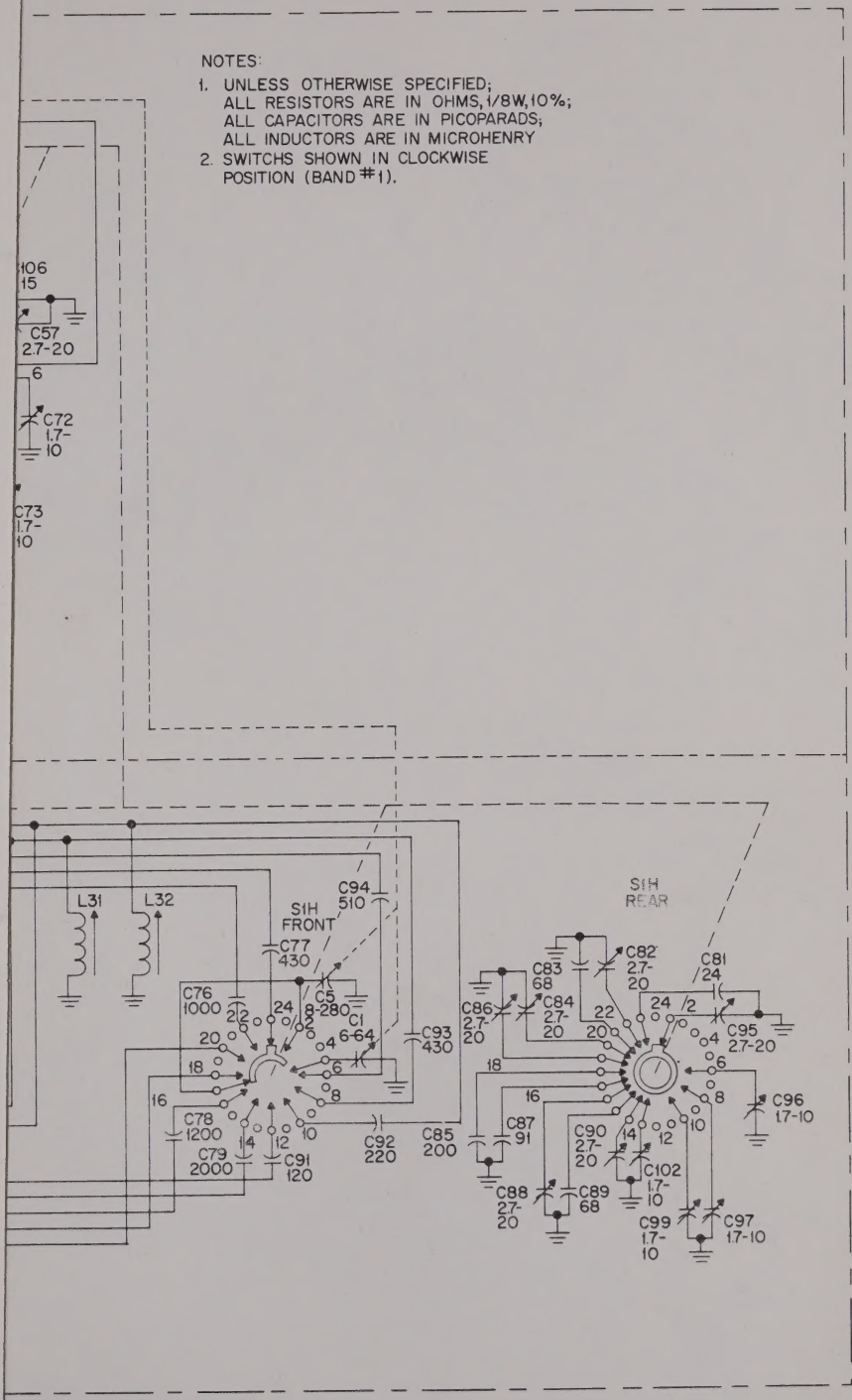


Figure 5-31. Tuner Assembly A1A1, Schematic Diagram

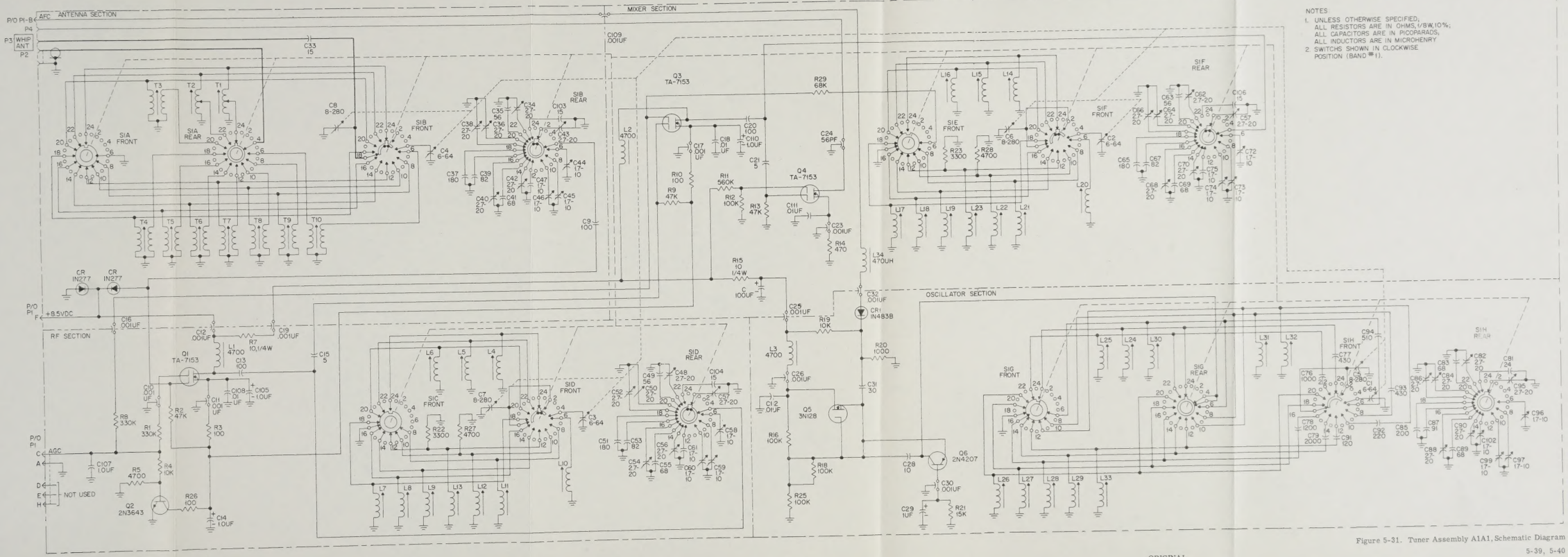
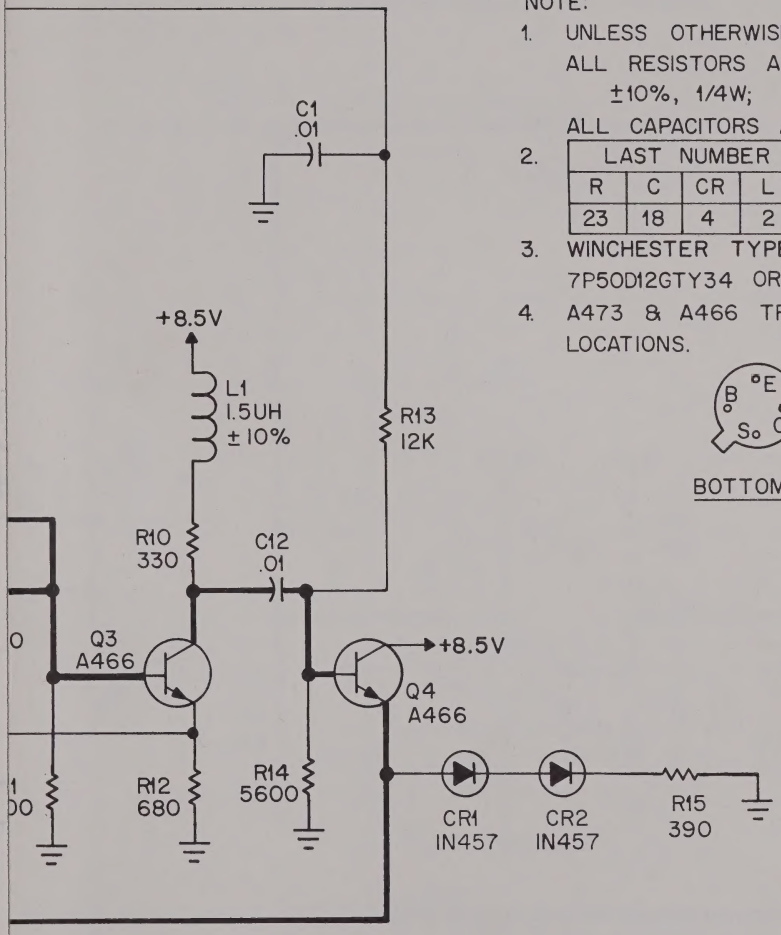


Figure 5-31. Tuner Assembly A1A1, Schematic Diagram

ORIGINAL



NOTE:

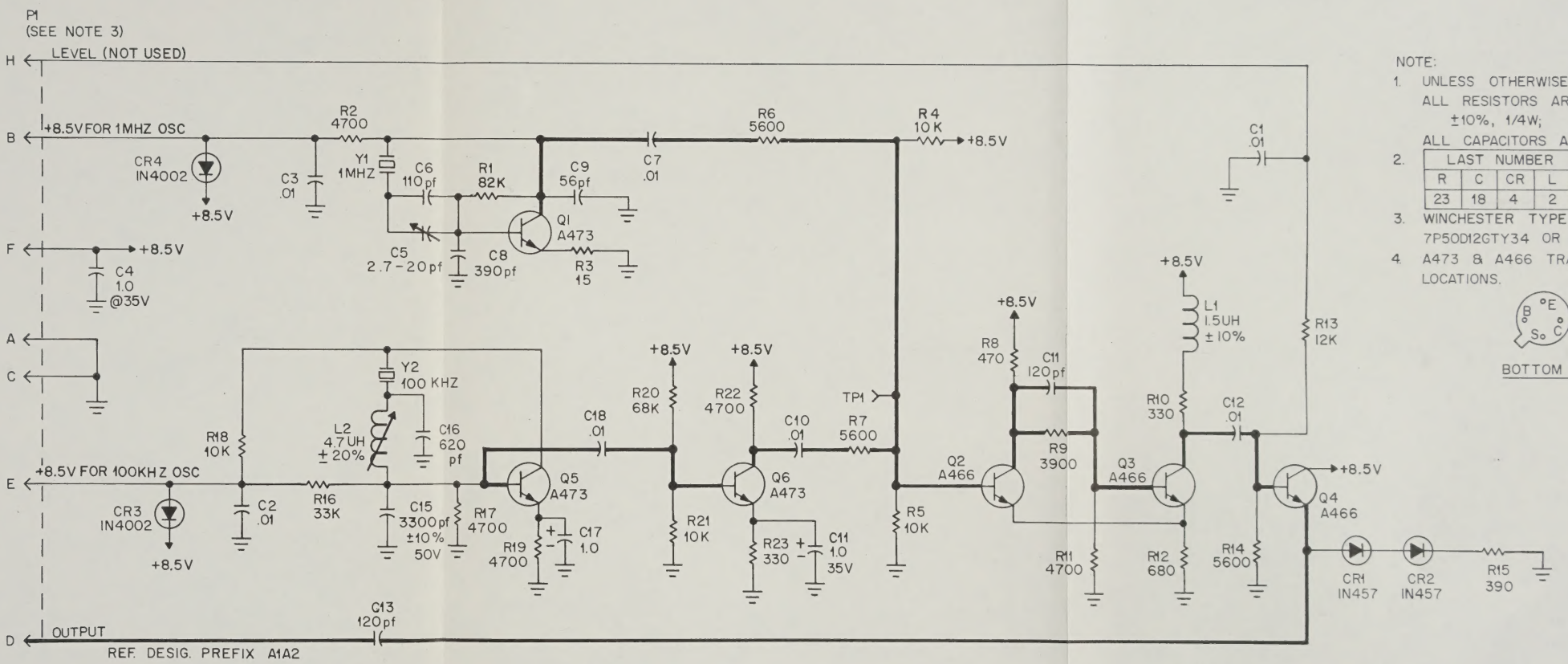
1. UNLESS OTHERWISE SPECIFIED; ALL RESISTORS ARE IN OHMS, ±10%, 1/4W; ALL CAPACITORS ARE IN UF.
2.

LAST NUMBER USED					
R	C	CR	L	Y	Q
23	18	4	2	2	6

3. WINCHESTER TYPE SMRE 7P50D12GTY34 OR EQUIV.
4. A473 & A466 TRANSISTOR PIN LOCATIONS.

BOTTOM VIEW

Figure 5-32. Frequency Calibrator A1A2, Schematic Diagram



NOTE:

1. UNLESS OTHERWISE SPECIFIED; ALL RESISTORS ARE IN OHMS, ±10%, 1/4W;
   ALL CAPACITORS ARE IN UF.
2.

LAST NUMBER USED					
R	C	CR	L	Y	Q
23	18	4	2	2	6

3. WINCHESTER TYPE SMRE 7P50D12GTY34 OR EQUIV.
4. A473 & A466 TRANSISTOR PIN LOCATIONS.

BOTTOM VIEW

Figure 5-32. Frequency Calibrator A1A2, Schematic Diagram

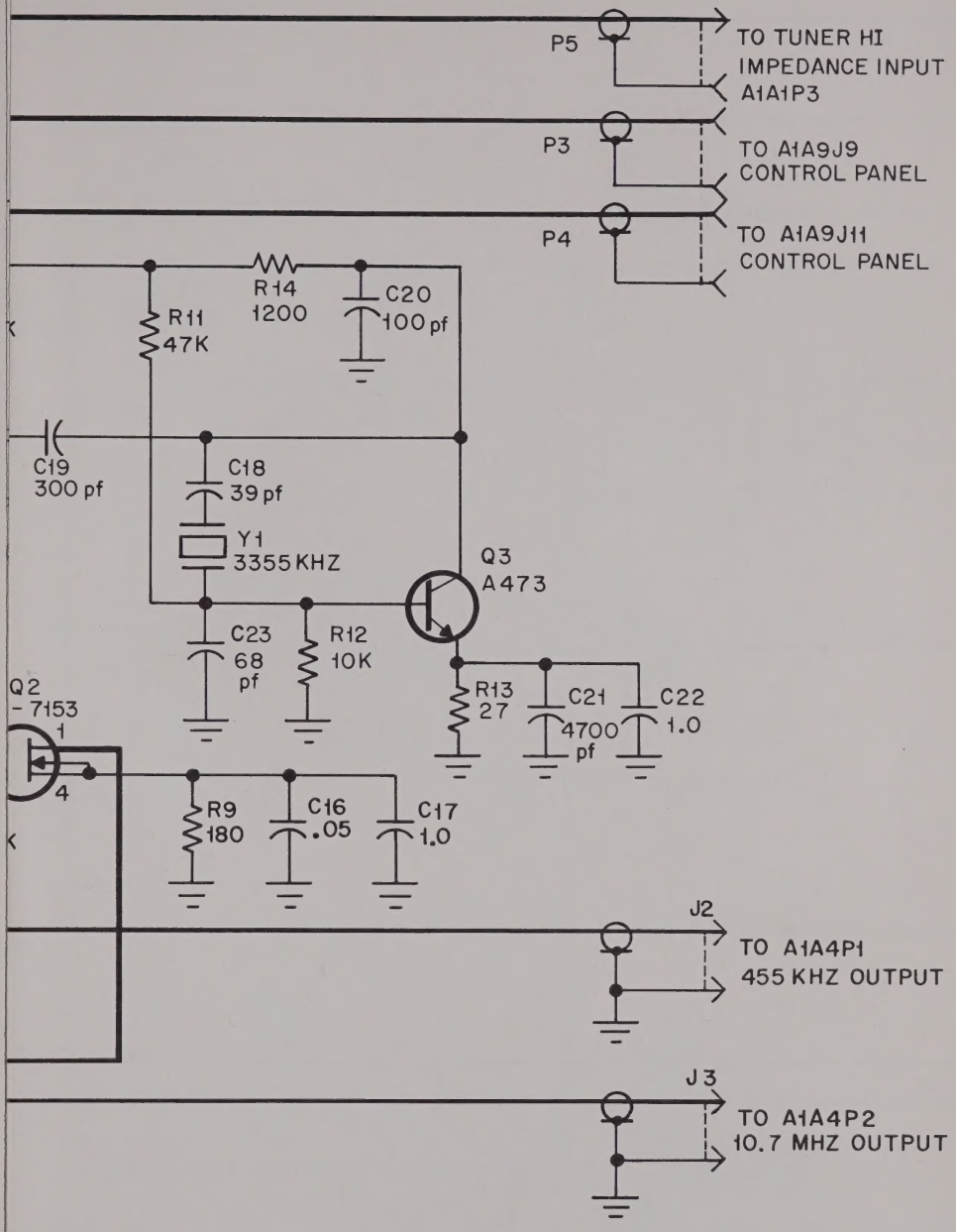
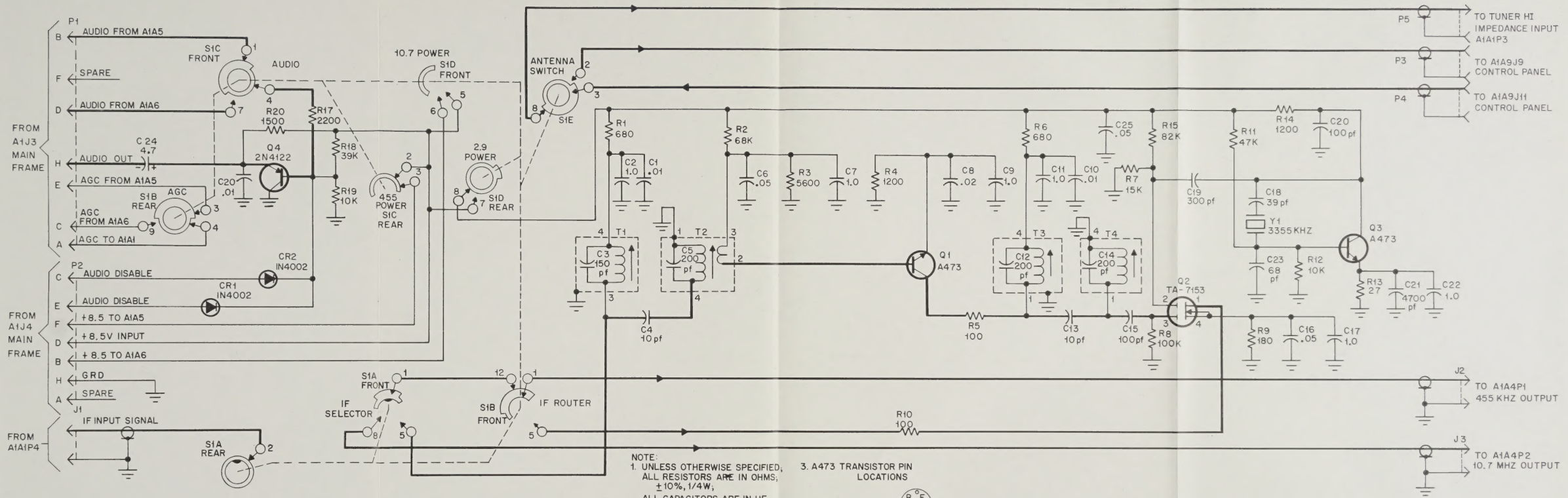


Figure 5-33. 2.9 MHz IF Amplifier A1A3, Schematic Diagram



REF DESIG PREFIX A1A3

NOTE:
1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE IN OHMS; ±10%, 1/4W; ALL CAPACITORS ARE IN UF.
2.

LAST NUMBER USED					
R	C	CR	T	Y	Q
20	26	2	4	1	4
NUMBERS NOT USED					
16					

3. A473 TRANSISTOR PIN LOCATIONS

BOTTOM VIEW

4. BAND SWITCH IN BAND 1 POSITION

Figure 5-33. 2.9 MHz IF Amplifier A1A3, Schematic Diagram

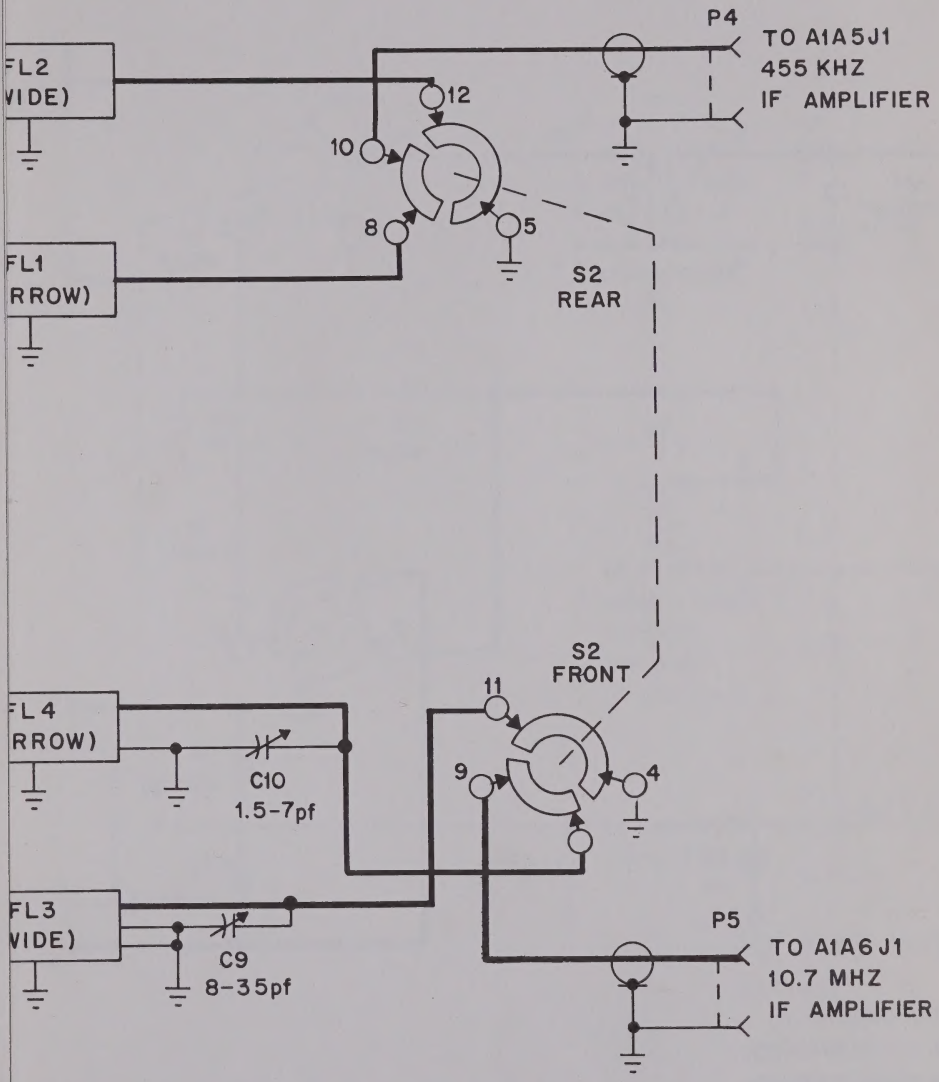
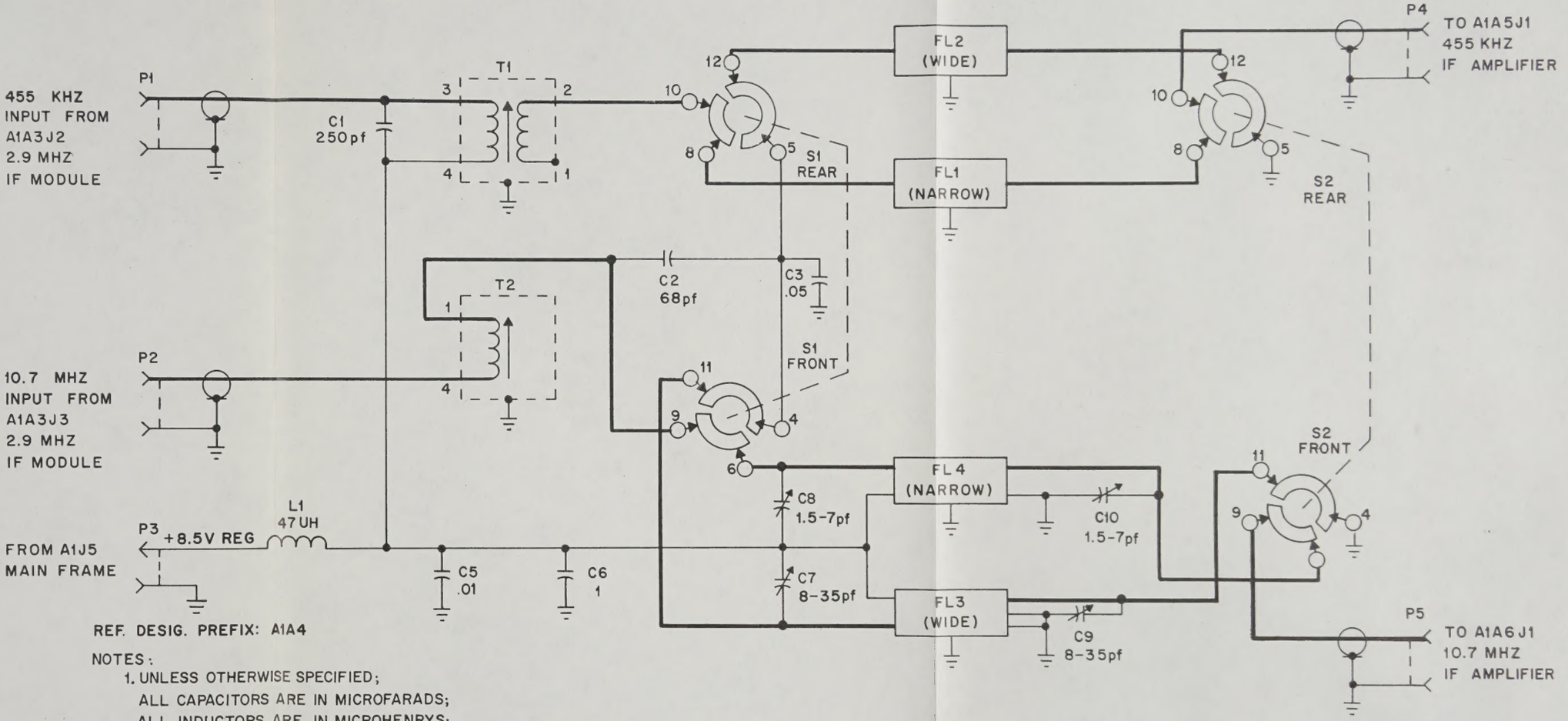


Figure 5-34. Filter Selector Module A1A4, Schematic Diagram



REF. DESIG. PREFIX: A1A4

NOTES:

1. UNLESS OTHERWISE SPECIFIED;
   ALL CAPACITORS ARE IN MICROFARADS;
   ALL INDUCTORS ARE IN MICROHENRYS;

Figure 5-34. Filter Selector Module A1A4, Schematic Diagram

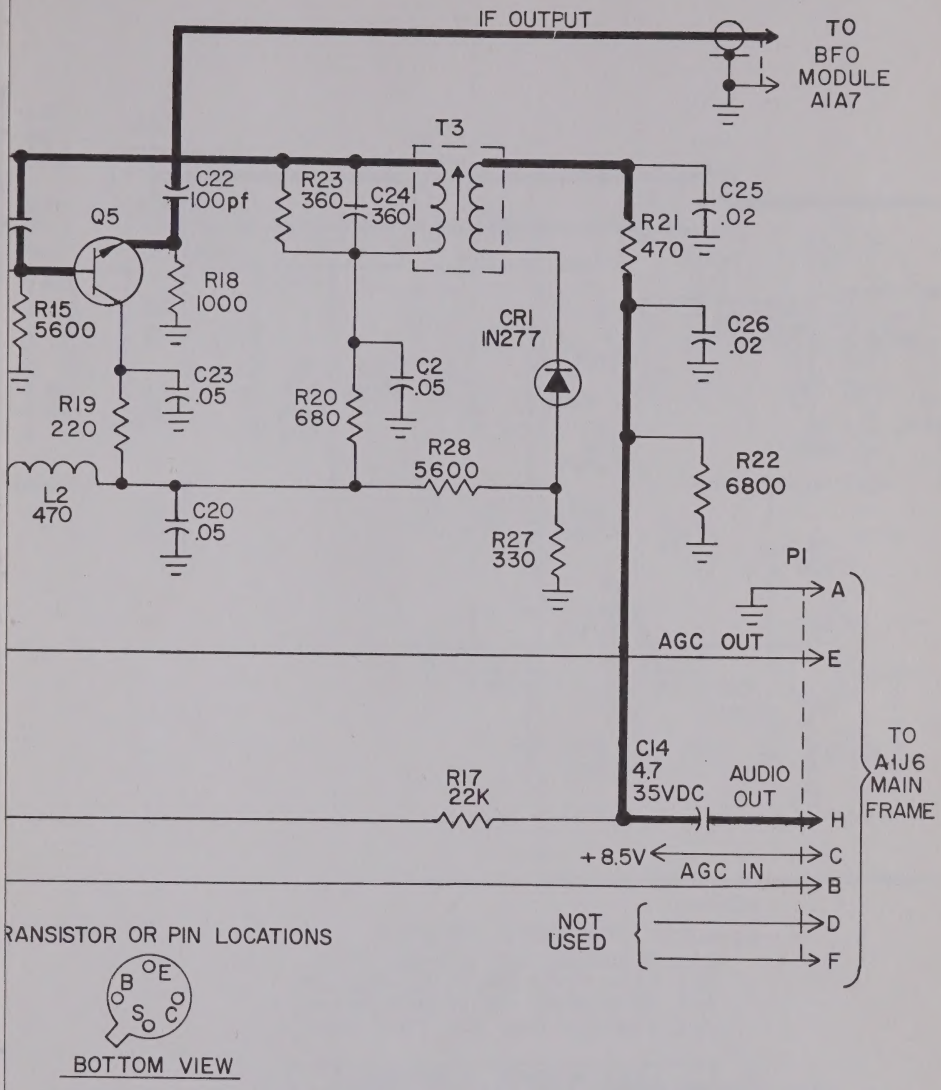
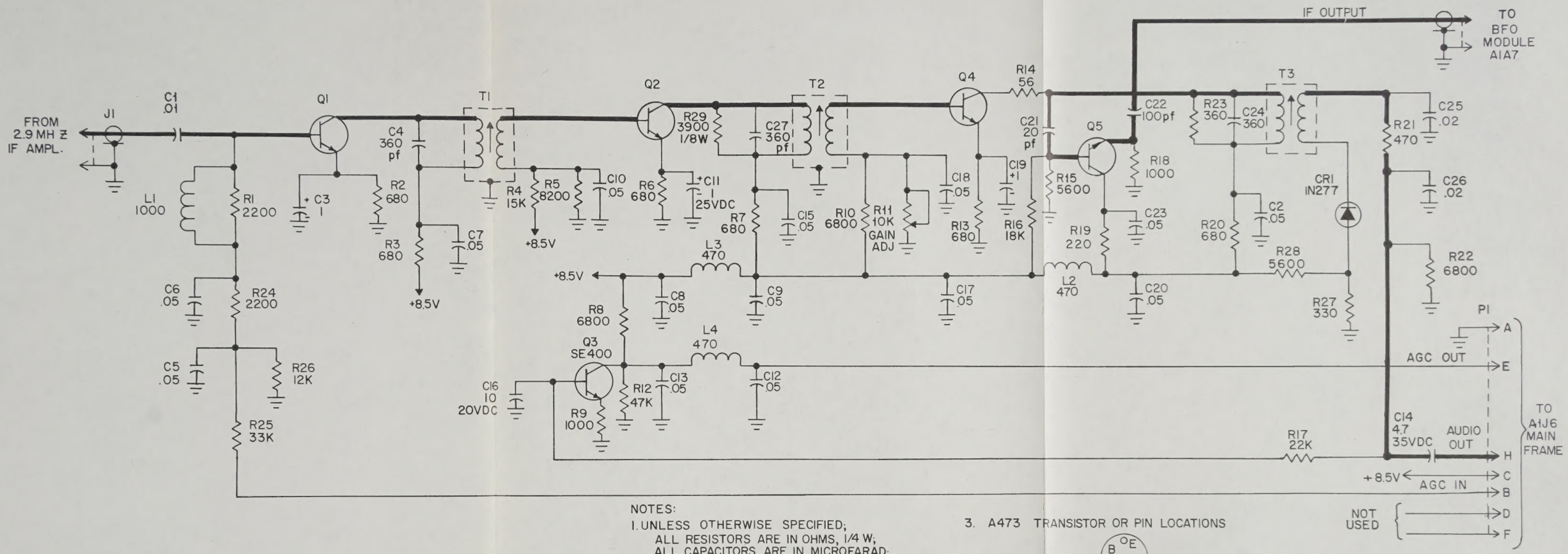


Figure 5-35. 455 kHz IF Amplifier A1A5, Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED;
   ALL RESISTORS ARE IN OHMS, 1/4 W;
   ALL CAPACITORS ARE IN MICROFARAD;
   ALL INDUCTORS ARE IN MICROHENRY;
   ALL TRANSISTORS ARE TYPE A473.

2.

LAST NUMBER COMPONENT					
R	C	CR	Q	L	T
28	23	1	5	4	3
NUMBER NOT USED					

3. A473 TRANSISTOR OR PIN LOCATIONS

BOTTOM VIEW

REF. DESIG. PREFIX: A1A5

Figure 5-35. 455 kHz IF Amplifier A1A5, Schematic Diagram

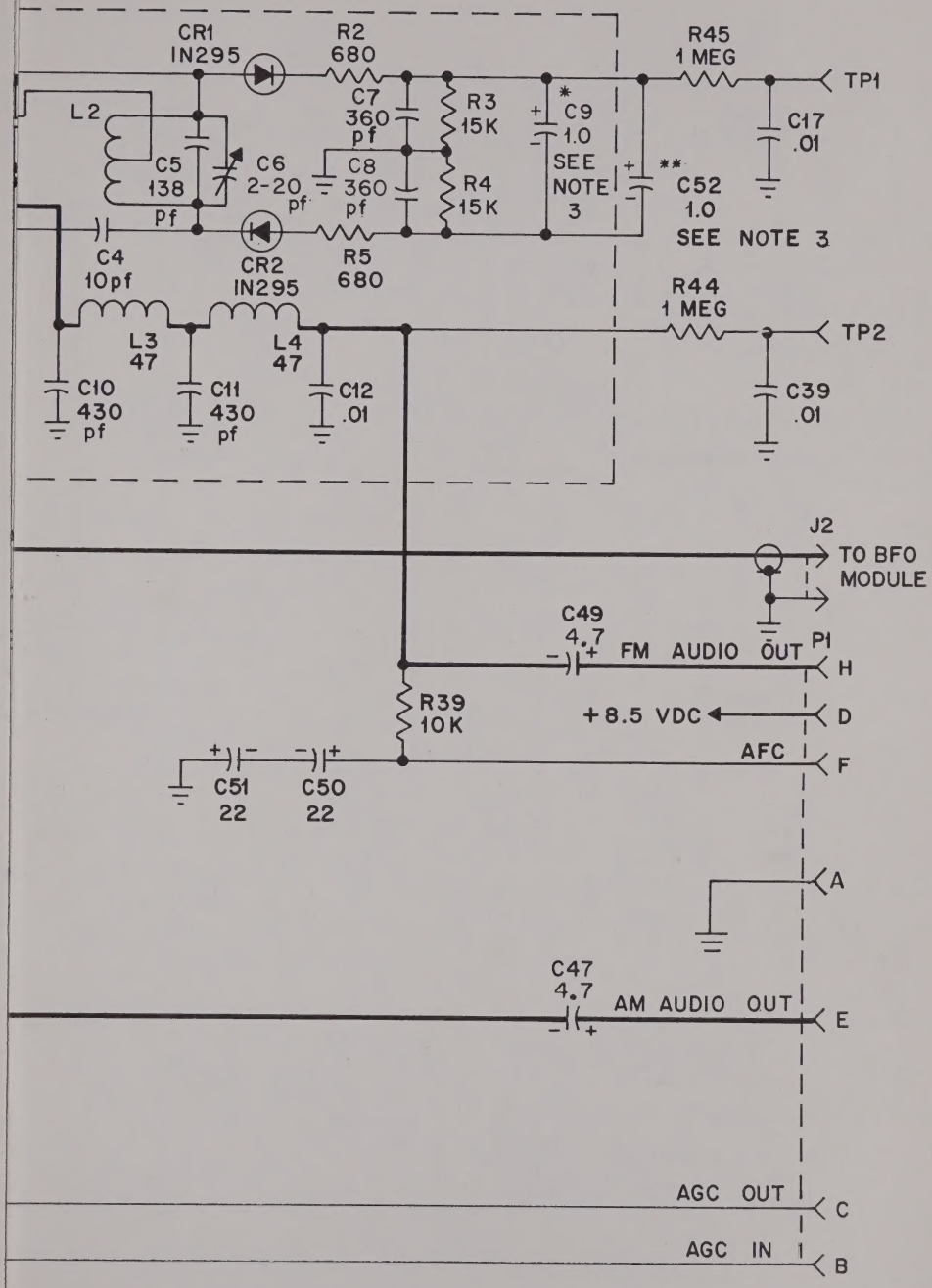
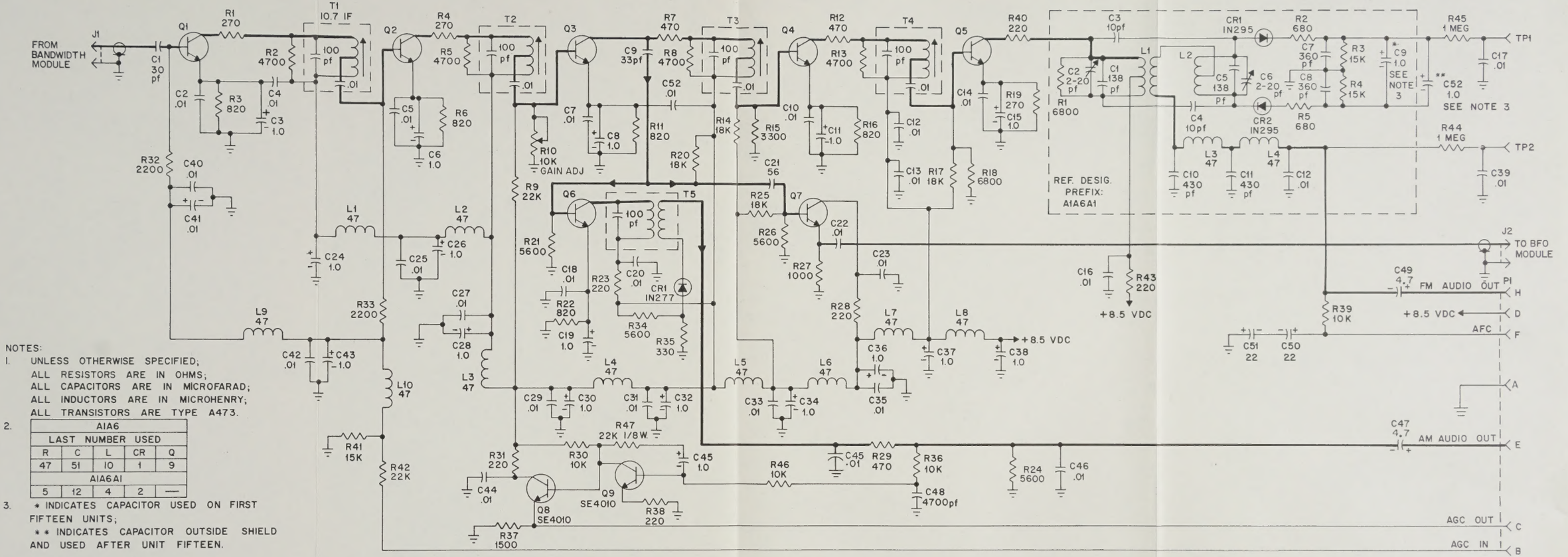


Figure 5-36. 10.7 MHz IF Amplifier A1A6, Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED;
   ALL RESISTORS ARE IN OHMS;
   ALL CAPACITORS ARE IN MICROFARAD;
   ALL INDUCTORS ARE IN MICROHENRY;
   ALL TRANSISTORS ARE TYPE A473.
2.

A1A6				
LAST NUMBER USED				
R	C	L	CR	Q
47	51	10	1	9
A1A6A1				
5	12	4	2	—

3. * INDICATES CAPACITOR USED ON FIRST FIFTEEN UNITS;
   ** INDICATES CAPACITOR OUTSIDE SHIELD AND USED AFTER UNIT FIFTEEN.

REF. DESIG. PREFIX: A1A6

Figure 5-36. 10.7 MHz IF Amplifier A1A6, Schematic Diagram

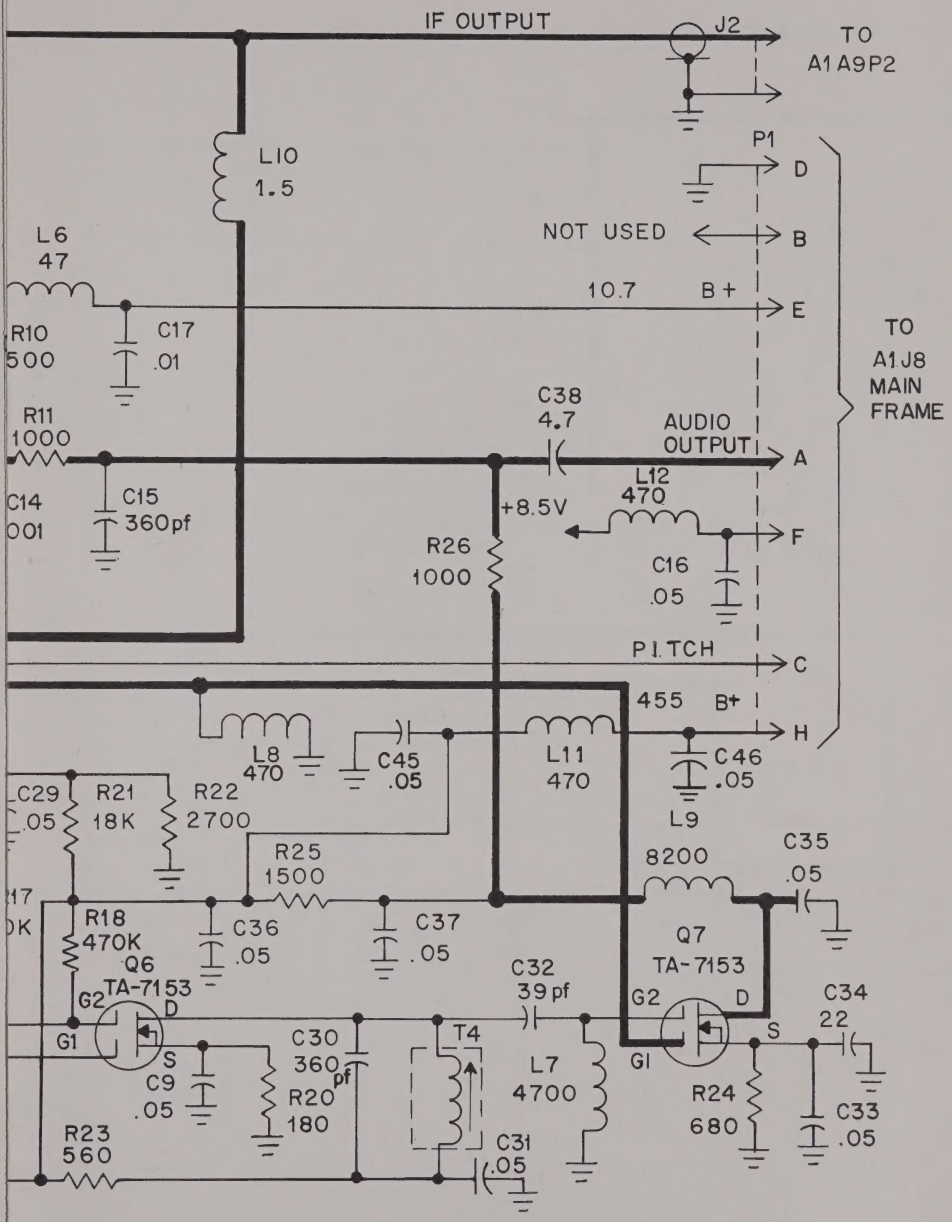
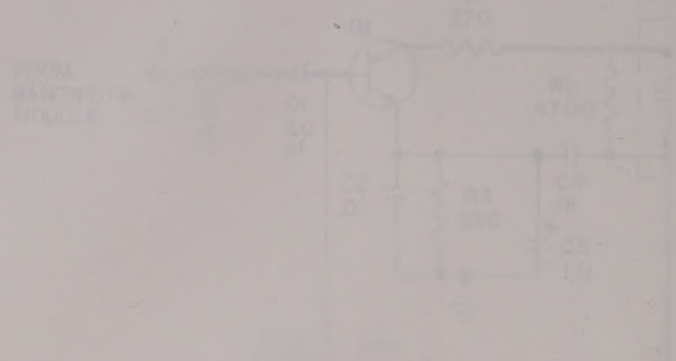


Figure 5-37. Beat Frequency Oscillator and Product Detector A1A7, Schematic Diagram



NOTE:

1. UNLESS OTHERWISE SPECIFIED;
   ALL RESISTORS ARE IN OHMS, ±10%, 1/4W
   ALL CAPACITORS ARE IN MICROFARADS
   ALL INDUCTORS ARE IN MICROHENRYS

2.

LAST NUMBER USED					
R	C	CR	L	Q	T
31	46	2	12	8	5
NUMBER NOT USED					

REF DESIG PREFIX A1A7.

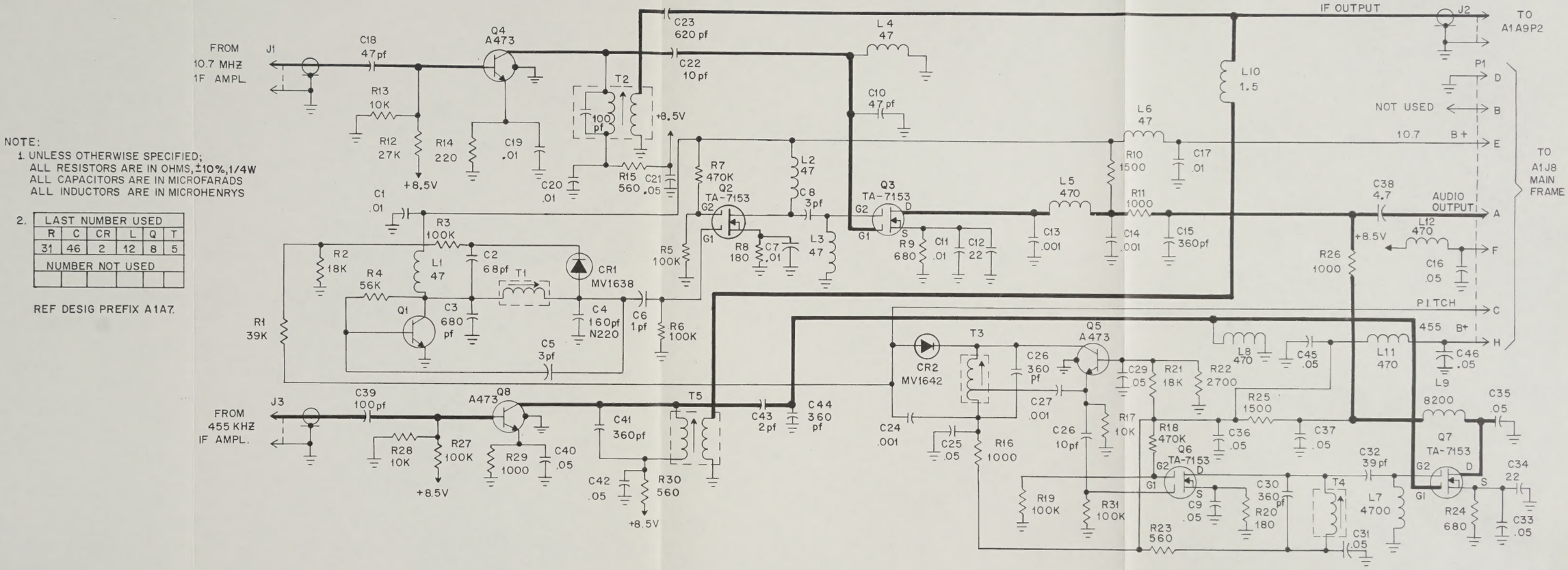


Figure 5-37. Beat Frequency Oscillator and Product Detector A1A7, Schematic Diagram

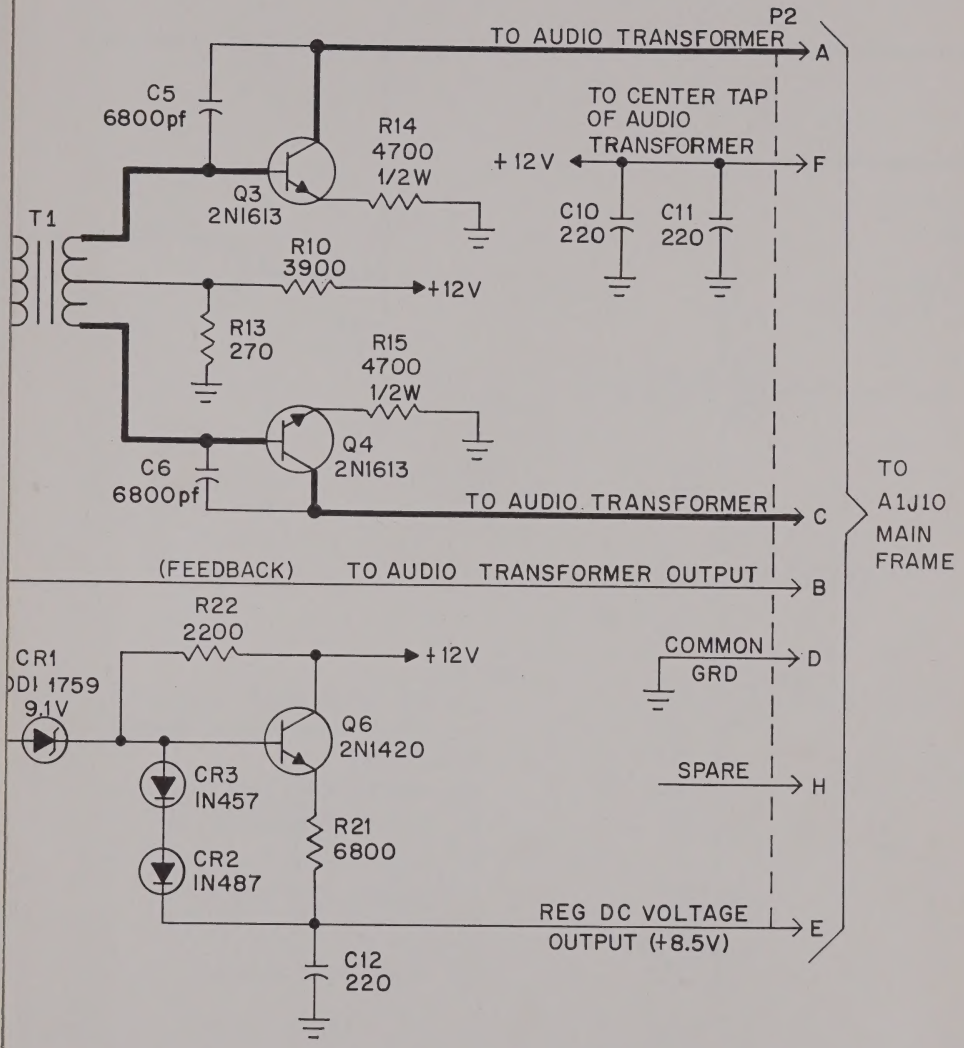
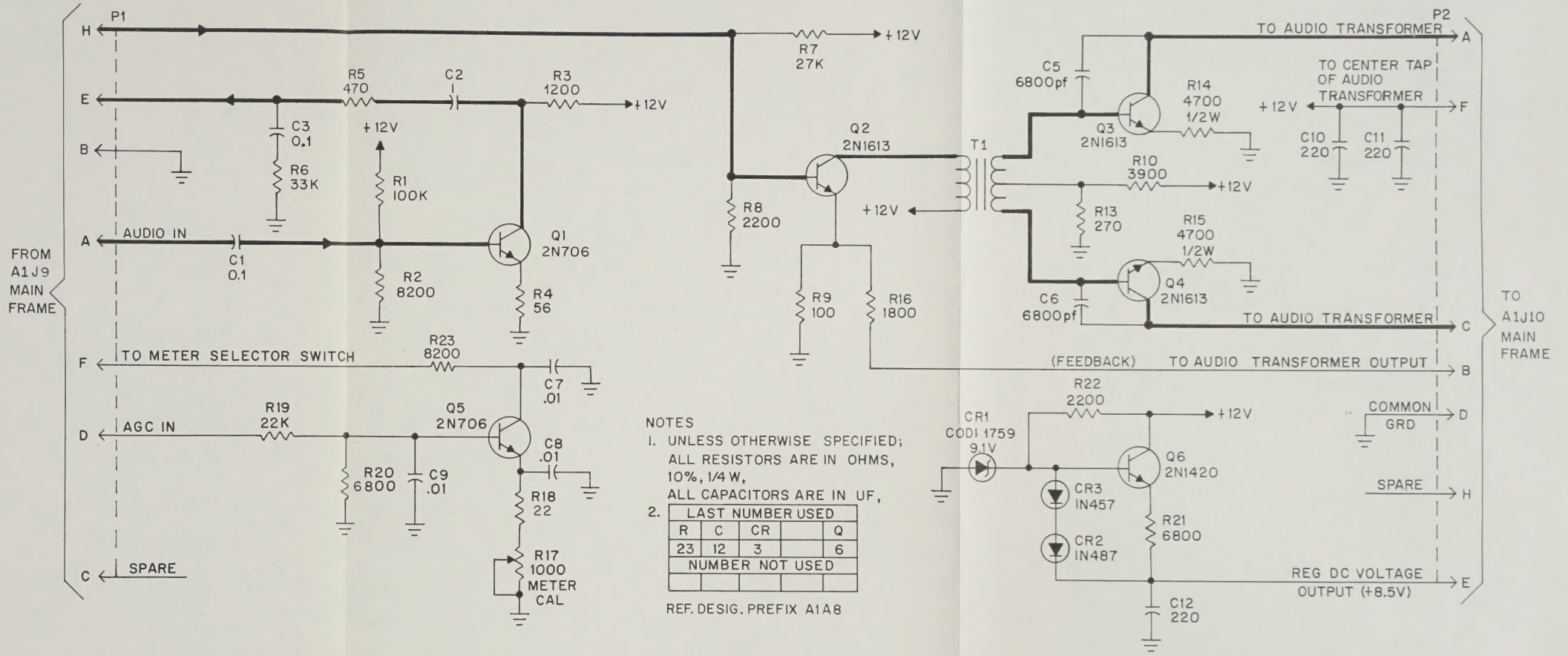


Figure 5-38. Audio Module A1A8, Schematic Diagram



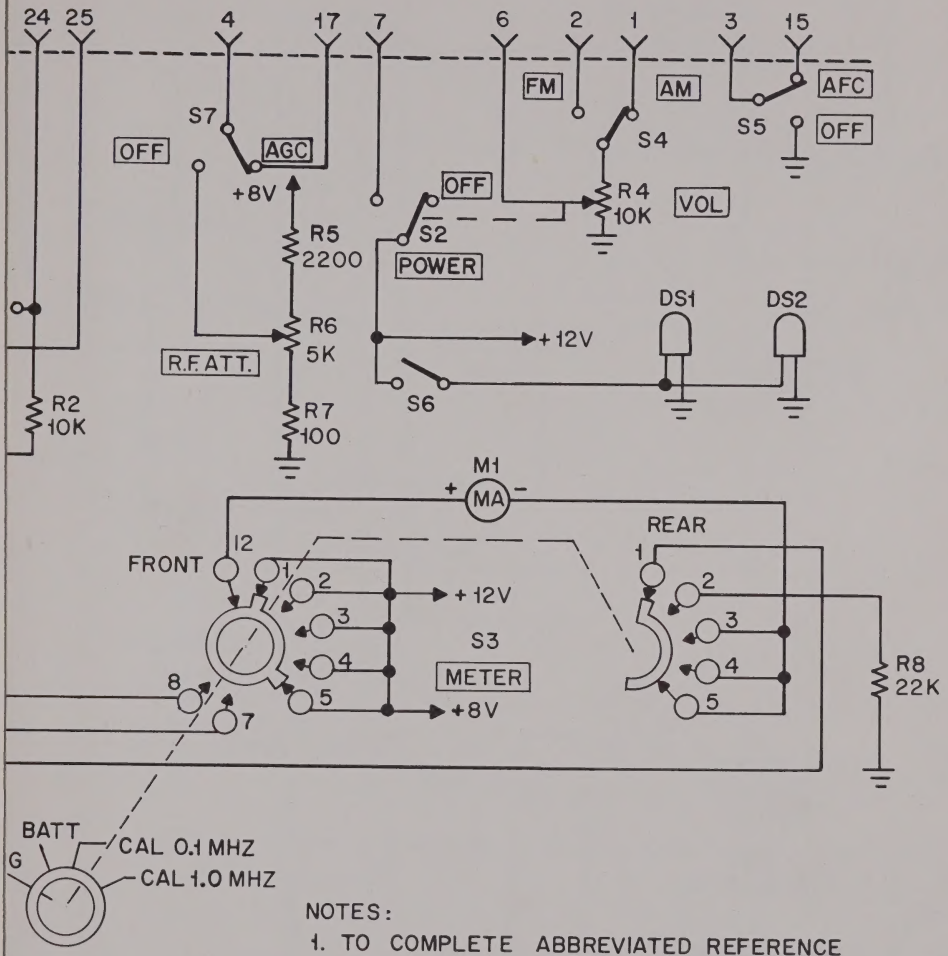
NOTES

1. UNLESS OTHERWISE SPECIFIED;
   ALL RESISTORS ARE IN OHMS,
   10%, 1/4 W,
   ALL CAPACITORS ARE IN UF,
2.

LAST NUMBER USED				
R	C	CR		Q
23	12	3		6
NUMBER NOT USED				

REF. DESIG. PREFIX A1A8

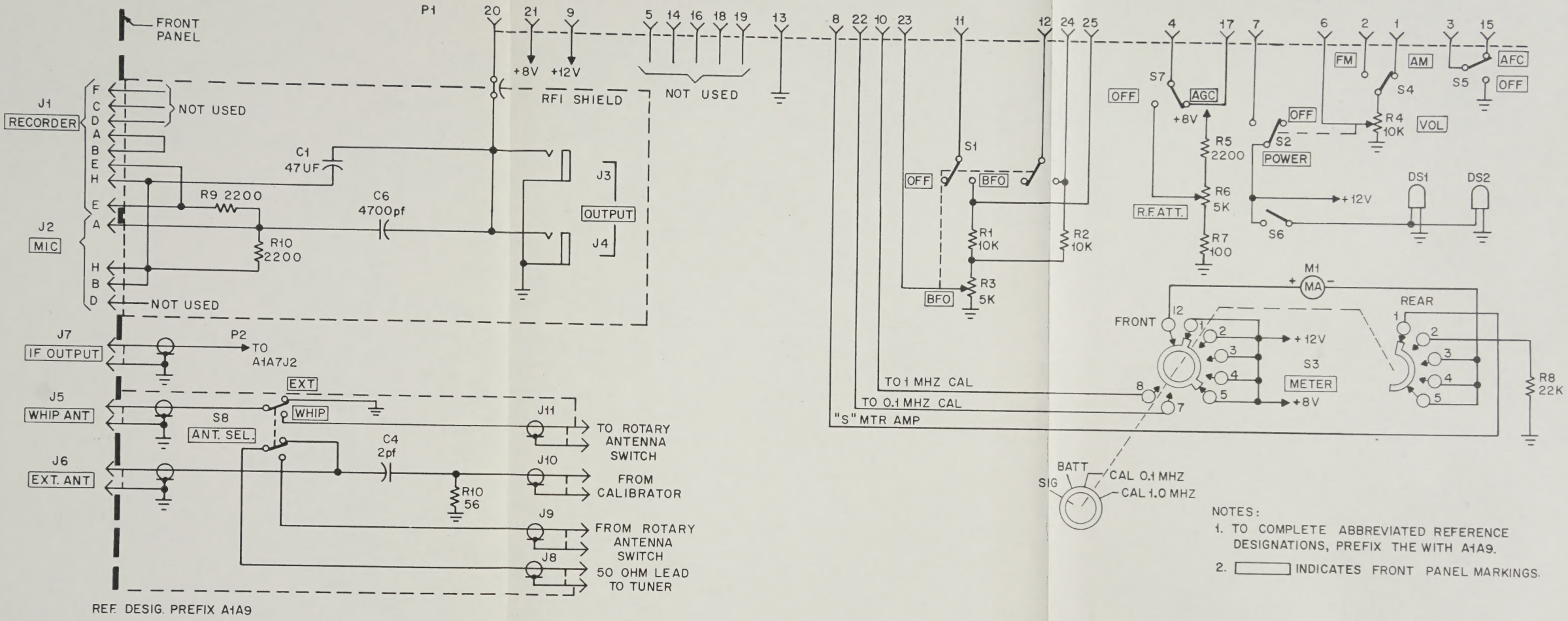
Figure 5-38. Audio Module A1A8, Schematic Diagram



NOTES:

1. TO COMPLETE ABBREVIATED REFERENCE DESIGNATIONS, PREFIX THE WITH A1A9.
2. [ ] INDICATES FRONT PANEL MARKINGS.

Figure 5-39. Control Panel AN/PRR-15 A1A9, Schematic Diagram



NOTES:

1. TO COMPLETE ABBREVIATED REFERENCE DESIGNATIONS, PREFIX THE WITH A1A9.
2. [ ] INDICATES FRONT PANEL MARKINGS.

Figure 5-39. Control Panel AN/PRR-15 A1A9, Schematic Diagram

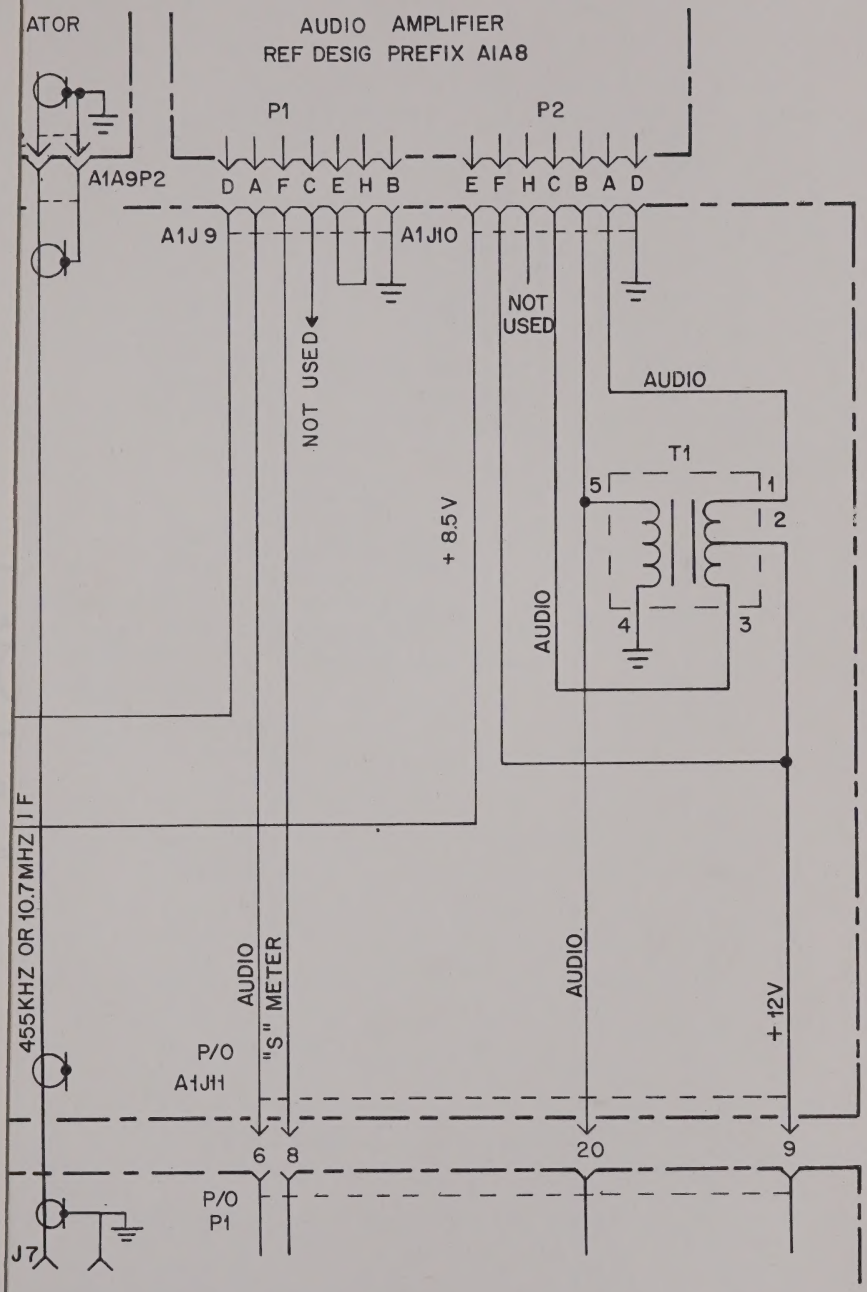


Figure 5-40. AN/PRR-15 Main Wiring Diagram A1

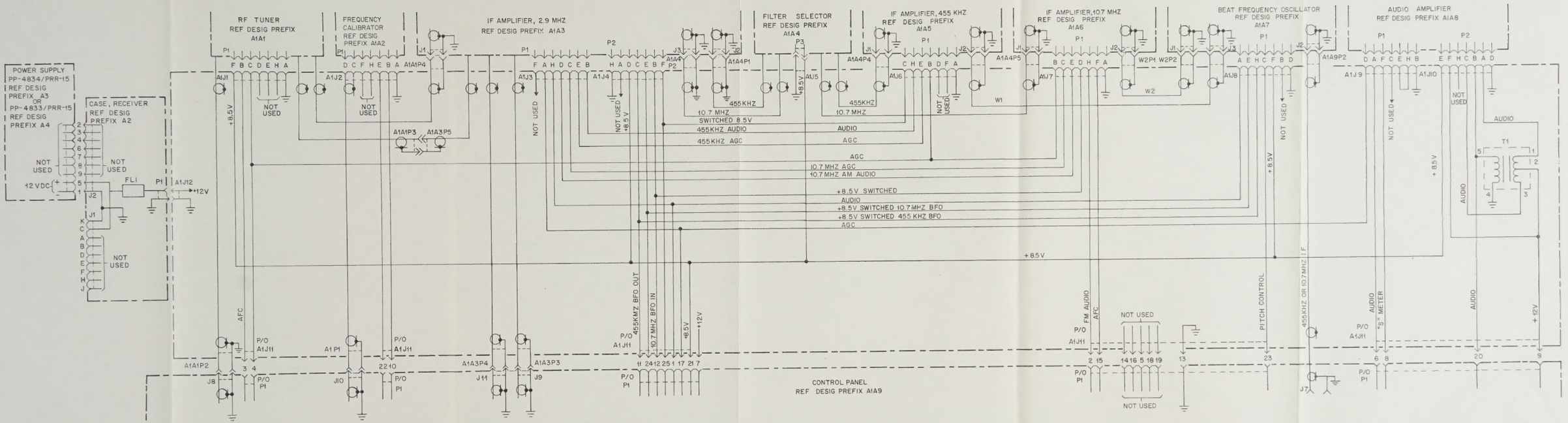


Figure 5-40. AN/PRR-15 Main Wiring Diagram A1

ORIGINAL

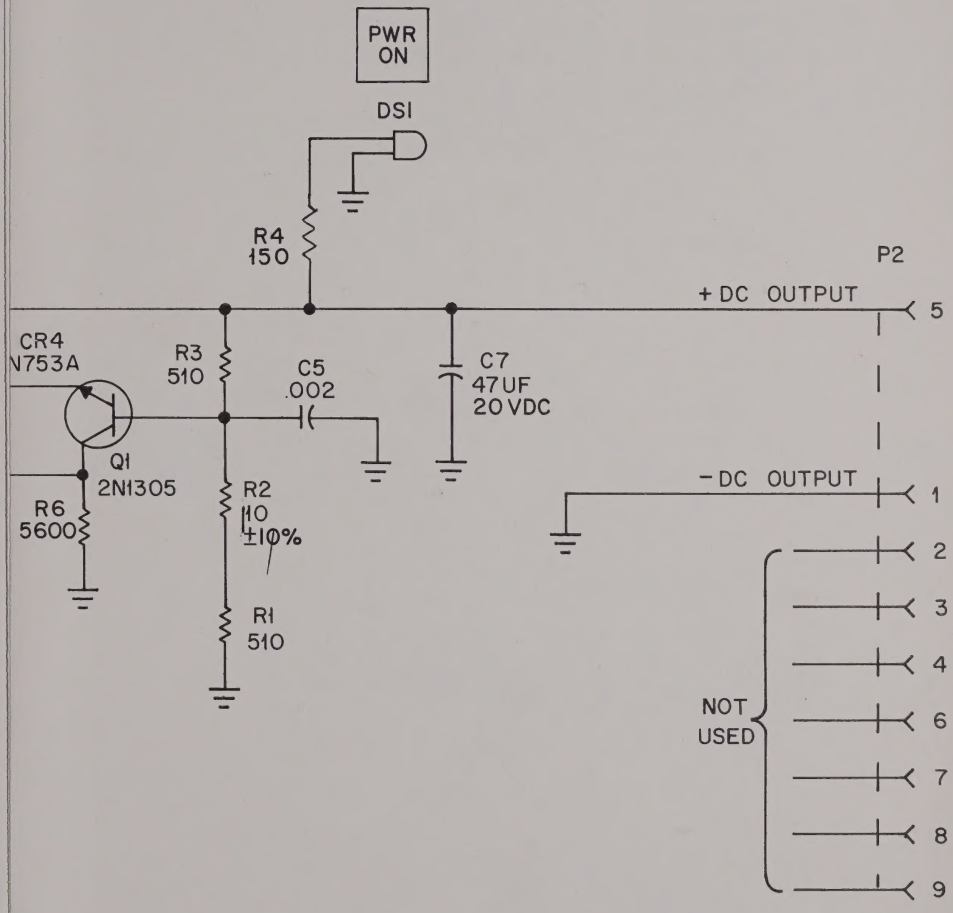
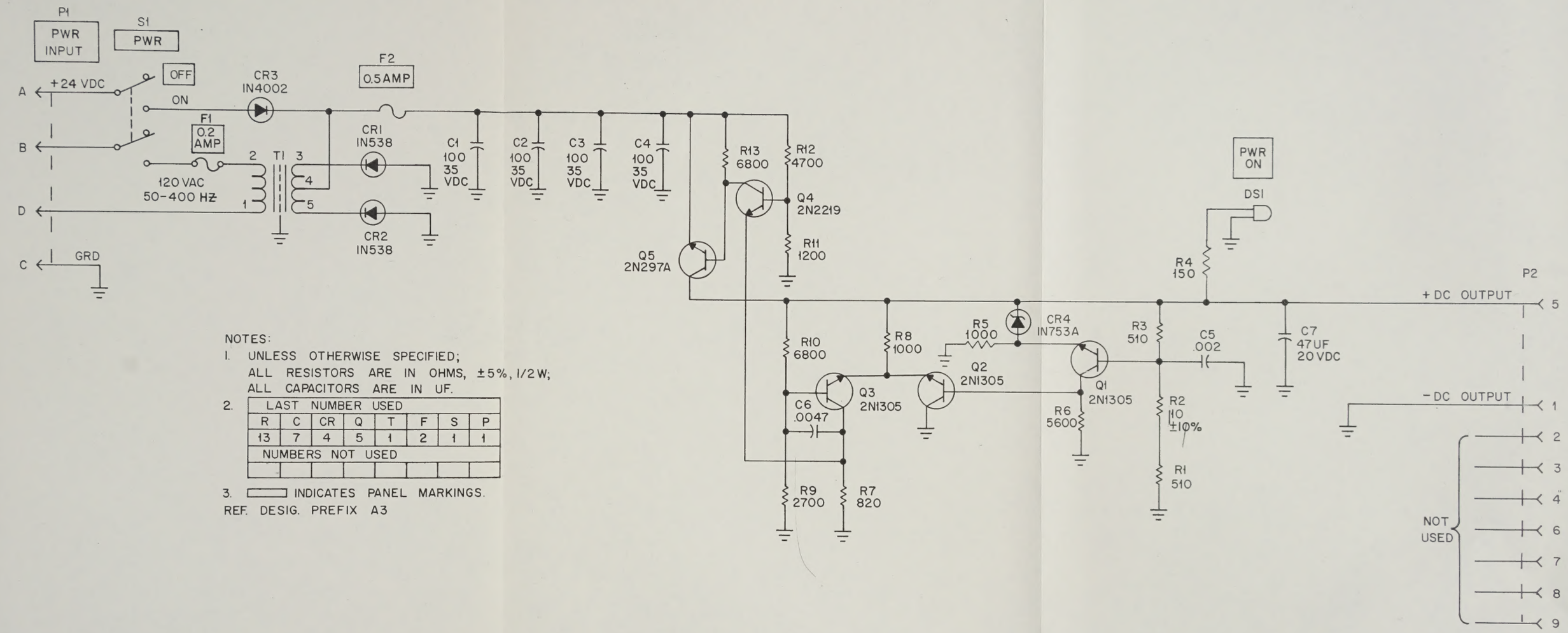


Figure 5-41. Power Supply PP-4834/PRR-15 A3, Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED;
   ALL RESISTORS ARE IN OHMS, ±5%, 1/2W;
   ALL CAPACITORS ARE IN UF.
2.

LAST NUMBER USED							
R	C	CR	Q	T	F	S	P
13	7	4	5	1	2	1	1
NUMBERS NOT USED							

3. ▭ INDICATES PANEL MARKINGS.

REF. DESIG. PREFIX A3

Figure 5-41. Power Supply PP-4834/PRR-15 A3, Schematic Diagram